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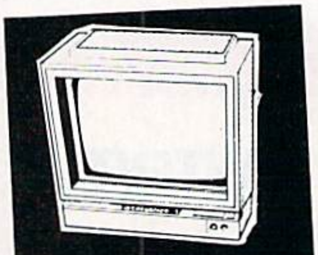

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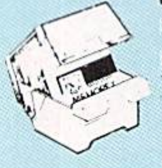

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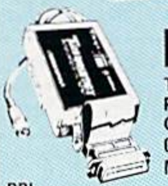

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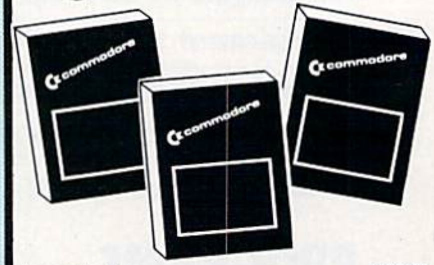

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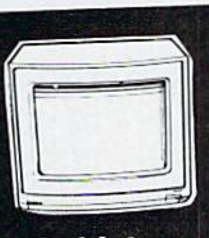

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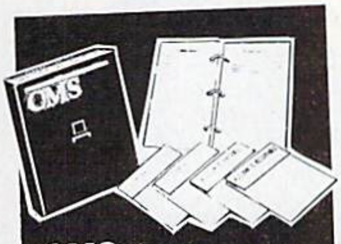

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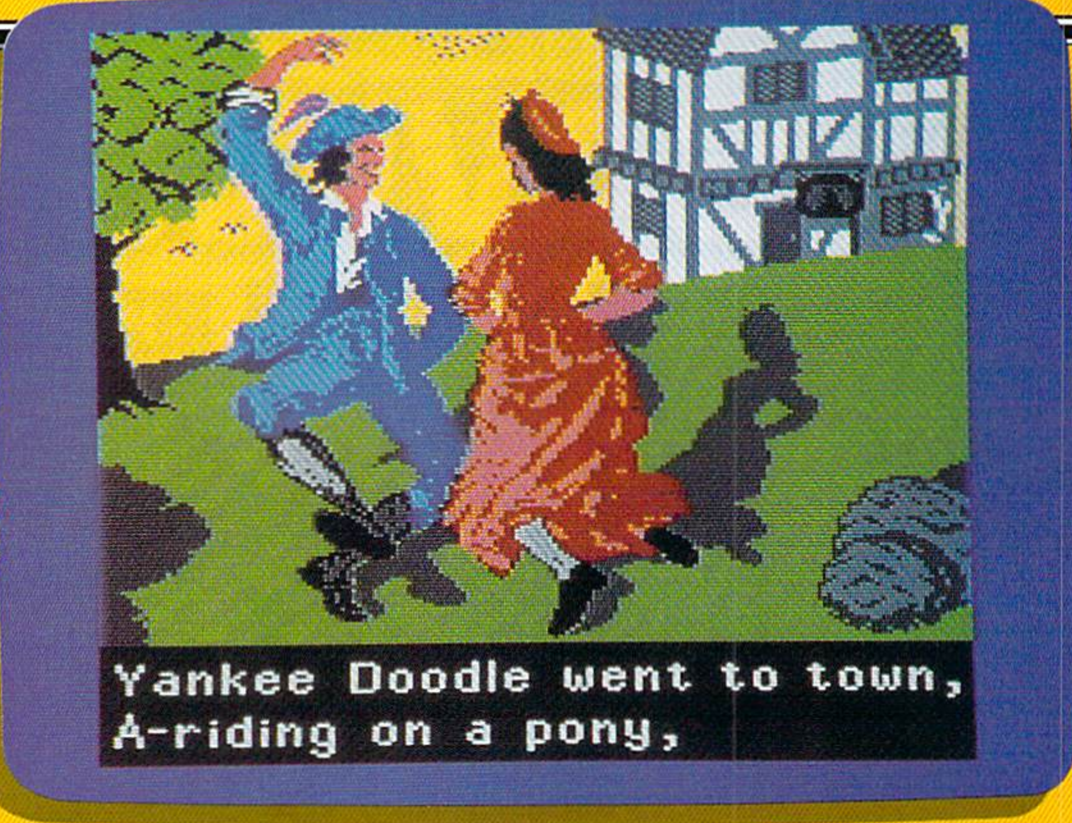

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VIEW FROM THE BRIDGE

While we make no apologies for not being able to cover *everything*, we admit that we've been lax regarding educational software. Richard Herring covered the field definitively in his six part series (March-August '84); but since then, no feature article space has been devoted to the subject.

So, on the second anniversary of the launching of that acclaimed series, we update *Ahoy!*'s readers on the educational software market. Joyce Worley's *Playing It Smart with Computer Software,* headlining this month's *Entertainment Software Section*, surveys more than 40 of today's most popular commercial packages. (Turn to page 41.)

And to teach you how to program educational games, who would we turn to but Orson Scott Card? You'll find this month's edition of *Creating Your Own Games on the Commodore 64* a bit different from the usual—more concerned with educational and programming theory than with technical fundamentals. Orson Scott also includes *The Most and the Least,* a program enabling users to design their own educational trivia games. If you're not in a creative mood, the *Which Is...?* module also provided will allow you to quiz your kiddies (or yourself) on a variety of subjects. Three other modules—*U.S. Geography, U.S. History,* and *World Geography*—are not included in the magazine, but are available on this month's *Ahoy!* program disk. We're not trying to gouge you for extra money—the modules are just too long to include in our program listings section without crowding out almost everything else in it. From time to time, we'll continue to make bonus material available to you in this way. (Turn to page 18.)

While not contributing to this month's educational theme, Morton Kevelson is as usual an education in himself. In taking over this issue's *Reviews* section, Morton examines the latest in memory dump programs, as well as the X-10 Powerhouse system for interfacing your computer to the outside world. (Turn to page 57.)

If a memory dumper offers capabilities beyond your current needs, but you would like to be able to back up your valuable disks, Cheryl Peterson offers tips on choosing a copy program in this month's *Cadet's Column.* (Turn to page 85.)

Yes, we've taken our time about getting C-128 programs into our magazine. But it's taken the freelance programmers on whom we rely some time to become familiar enough with the machine to produce high-quality work (something that hasn't prevented certain other Commodore magazines from publishing the first dreck they could get their hands on!). But you'll find that Jeffrey Lih's *Ahoy!Term 128* was worth waiting for. The terminal emulator program is a sophisticated piece of software that will also work with the C-64. (Turn to page 13.)

C-128 owners will also be pleased to know that Dale Rupert will be covering the machine in future *Rupert Reports.* This month's installment lists many of the advanced features Dale discovered during his first months with the 128. (Turn to page 34.)

We didn't think seven-plus pages of typing was out of hand for a banner-printing program as good as Bob Spirko's *Streamer Font* (Jan. '86). But if you did, perhaps Curtis Kaylor's 18-line *Banner* will suit you. Shorter than that we can't make it. (Turn to page 88.)

Very-Able will help keep your original programs from turning into spaghetti due to variable mismanagement. (Turn to page 52.)

For those oddballs who don't want to go blind trying to decipher Commodore graphics characters onscreen or in printouts, *Easy-Lister* translates them into mnemonics similar to those used in *Ahoy!*'s program listings. (Turn to page 51.)

Programmer's Aid comprises an assortment of brief BASIC subroutines to use in writing your own programs. (Turn to page 87.)

If you still hook up your Atari 5200 every now and then just to play *Super Breakout*—put it back in the closet and leave it there! *Brickbusters* will provide comparable graphics and gameplay on your 64. (Turn to page 55.)

In this month's *Commodore Roots,* Mark Andrews clues you into techniques used by professional assembly language programmers to alter the Commodore 64 character set, and provides programs to facilitate the process. (Turn to page 76.)

We have just enough room left to tell you about one more item in this month's *Ahoy!*—that is, in some copies of this month's *Ahoy!* If you're a subscriber, you've doubtless seen the *Ahoy! Access Club Clipper* bound between the front cover and the contents page. On a bimonthly basis, the *Clipper* will bring members of the *Ahoy!* Access Club (i.e., all subscribers) discounts on assorted mail order hardware and software as well as a variety of other services. We expect the *Clipper* to grow in popularity among readers and manufacturers alike, to the point where anyone interested in buying anything for a Commodore computer will turn to it as their first source of supply.

But to get involved, you have to subscribe. Yes, here we are trying to gouge you for your $19.95. But being gouged never paid off so well! Especially when you can still obtain a free PlayNET membership kit (value $19.95) with your paid subscription. This offer may be withdrawn shortly, so we recommend subscribing immediately.

After all, you wouldn't want to miss everything else we have ahead for you in the next twelve months!

—David Allikas

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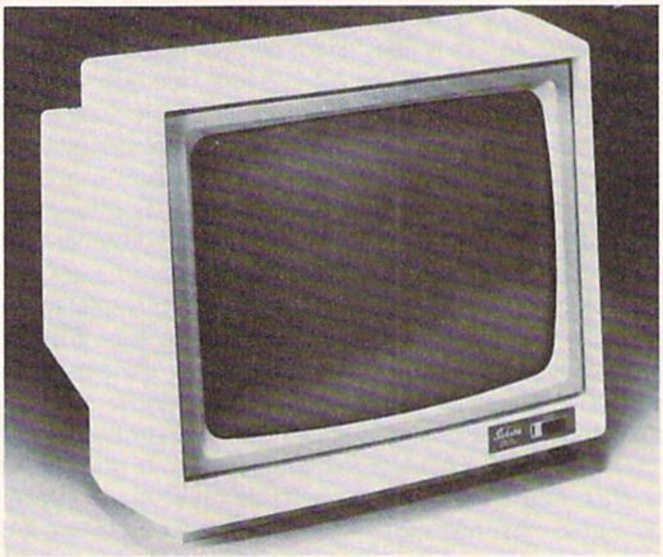
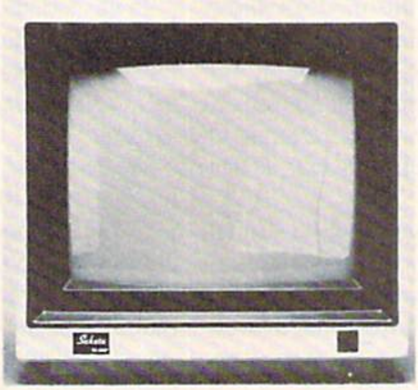
C. Itoh Digital Products, 19750 South Vermont Avenue, Suite 220, Torrance, CA 90502 (phone: 800-423-0300 or 213-327-2110).

Sakata's 13" RGB Performance Monitor (Model SC-300P) features non-glare tube, 800 X 400 dot display, 90°, 0.31 mm dot pitch with self-convergence, RGBI type signal input with a positive video signal TTL level, negative horizontal drive TTL level, and negative vertical drive TTL level. Scanning frequency is 24.83 KHz ± 500 Hz (55 Hz ± 2Hz with 16 display colors). Up to 2000 characters (7 X 11 dots, 80 X 25) can be displayed.

Sakata has also announced their High Resolution Monochrome Amber Monitor, which features a 25 MHz video band width, horizontal frequency of 18.43 KHz and vertical frequency of 60 KHz, 800 X 750 dot resolution, 2000-character display format (5 X 7 dots, 80 X 25), and distortion and linearity less than ± 10%.



Sakata's High Resolution Monochrome Monitor features 800 X 750 dot resolution. Many 64 owners use such monitors, with the necessary software, for 80-col. displays. READER SERVICE NO. 235



Sakata's RGB monitor: 800 X 400. READER SERVICE NO. 236

Sakata U.S.A. Corporation, 651 Bonnie Lane, Elk Grove Village, IL 60007 (phone: 312-593-3211).

LIGHT PEN UPGRADE

The Flexidraw Light Pen Graphics System, currently available as version five, has been found inadequate for use on certain phospher monitors, particularly amber ones. The forthcoming upgrade, available as an option at the time of purchase, will have greater sensitivity on monochrome monitors.

Inkwell Systems, 7767 Ronson Rd., #210, San Diego, CA 92138 (phone: 619-268-8792).

TRANSPARENT INTERRUPT UTILITIES

"Transparent" utilities, which reside in RAM and can be called up during execution of another program, have proved popular among IBM PC users. Cardco's *StealthTec* line of cartridge-based utilities now offer the same type of transparent interrupt mechanism to Commodore owners.

The *Freeze Frame* screen dump utility allows users to send whatever is on their computer's screen to the printer with a couple of keystrokes. While screen dump programs are nothing new, *Freeze Frame* supports virtually all programs and programming languages, and any printer or printer interface that emulates the Commodore 1525 (or Epson- or Okidata-compatible printer).

A second, as yet unnamed business/productivity utility will provide in-

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Skyles Catalogue Page 3

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Reader Service No. 230

Missing Letter Puzzle

1) Insert your COMAL disk in drive*.
2) Type LOAD "C64 COMAL*",8
3) Type RUN (starts COMAL)
4) Type AUTO (turn on auto line#'s)
5) Enter the program lines shown below (COMAL indents lines for you)
6) Hit RETURN key twice when done
7) Type RUN

```
Pr-gr-mm-r's P-r-d-s- P-ck-g-
Programmer's Par?
```

```
0010 dim text$ of 39, disk$ of 2
0020 open file 2,"missing.dat",read
0030 disk$:=status$; count:=0
0040 if disk$="00" then
0050   count'text
0060 else
0070   close // no data file found
0080   create'text
0090 endif
0100 play'game
0110 //
0120 proc count'text
0130   while not eof(2) do
0140     read file 2: text$
0150     count:+1
0160   endwhile
0170   close
0180 endproc count'text
0190 //
0200 proc create'text
0210   open file 2,"missing.dat",write
0220   print "input text (or blank):"
0230   repeat
0240     input text$
0250     if text$>"" then
0260       write file 2: text$
0270       count:+1
0280     endif
0290   until text$=""
0300   close
0310 endproc create'text
0320 //
0330 proc play'game
0340   open file 2,"missing.dat",read
0350   for x:=1 to rnd(1,count) do
0360     read file 2: text$
0370   endfor x
0380   close
0390   for letter:=1 to len(text$) do
0400     if text$(letter) in "aeiou" then
0410       print "-",
0420     else
0430       print text$(letter),
0440     endif
0450   endfor letter
0460   print
0470   for letter:=1 to len(text$) do
0480     while key$<>text$(letter) do
0490       print "?"+chr$(157), //left
0500     endwhile
0510     print text$(letter),
0520   endfor letter
0530 endproc play'game
```

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6041 Monona Drive, Room 111
Madison, WI 53716
phone 608-222-4432

Reader Service No. 257

stant access to a calculator, appointment calendar, phone directory/database, memo writer, screen dump utility, all DOS functions, and more.

Initial versions will be for the C-64; C-128 versions will follow.

Cardco, Inc., 300 S. Topeka, Wichita, KS 67202.

HERRING BONES

We've lost count of the times manufacturers have gone ahead and made the modifications recommended by Morton Kevelson in his hardware reviews. Now Richard Herring has joined Morton the K as a "fourth party" developer. Based on Rich's nitpicks about the *Masterdisk* disk cataloging system (August '85 *Ahoy!*), Integrated-Software Systems has restructured and expanded its manual, fully automated the original printer setup within the software, and added the option to delete files from a disk's listing within the catalog.

Integrated-Software Systems, P.O. Box 1801, Ames, IA 50010 (phone: 515-233-2992).

HANDWEAVING PROGRAM

The *Handweavers' Input Program* allows you to choose from 16 preprogrammed threadings or type your own, using up to 8 harnesses. Up to 4 harnesses can be used for each weft, and one repeat of the pattern can use up to 16 wefts, not counting tabbies. There is a choice of 16 warp colors, and a choice of 16 colors for each weft. Honest, we're not making these words up. The C-64 program is available for $15.00 on disk or tape, and may be distributed as shareware.

Herbi Gray Handweaving, P.O. Box 2343, Olympia, WA 98507 (phone: 206-491-4138).

BOOKS

The 1986 edition of *Programmer's Market: Where & How to Sell Your Software* ($16.95) lists 700 software publishers (200 of them new), with information on who to contact, preferred format for submissions, terms of payment, and more. Information on breaking into contract programming and technical writing is also provided.

Writer's Digest Books, 9933 Alliance Road, Cincinnati, OH 45242 (513-984-0717).

C-128 Tricks & Tips, preannounced in November, has come available, offering information on producing hi-res graphics in 80 columns, using windows, and accessing the memory management unit. Price is $19.95.

Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510 (phone: 616-241-5510).

CBS WITHDRAWAL

In January we reported that CBS Software had pared their product line down to 45 titles and greatly reduced the prices of many of the remaining packages. If you interpreted that as a bad sign, you were right. CBS Inc. has now announced its complete withdrawal from the consumer marketplace. A new unit, CBS Interactive Learning, will develop and market computer software for the school, college, and medical markets. But no new CBS products will be made available through traditional retail channels.

With software publishers going belly up as frequently as they are nowadays, the demise of any one particular company seldom arouses concern. But the termination of CBS Software, for some time the most prolific supplier of educational software for the Commodore 64, is more frightening than most.

CBS Inc., 383 Madison Ave., New York, NY 10017 (phone: 212-872-2000).

PSYCHOLOGICAL TEST

Based on the Color Test of the same name (and developed in cooperation with Dr. Max Luscher), *The Luscher Profile* draws a psychological profile of a person based on his reaction to colors and shapes. For the C-64; $39.95.

Mindscape Inc., 3444 Dundee Road, Northbrook, IL 60062 (phone: 312-480-7667).

WORD WRITER ENHANCED

Timeworks has upgraded *Word Writer 128* (see review in January's *Ahoy!*) to include onscreen highlighting (underline, italicize, and/or boldface, and view each highlight before printing), superscript and subscript, headers and footers, and speed keys (for quickly accessing *Word Writer* commands).

Timeworks, Inc., 444 Lake Cook Road, Deerfield, IL 60015 (phone: 312-948-9200).

AMIGA BBS

The Amiga Information Network, which debuted in early December for use by developers and dealers, was scheduled to have been opened to consumers by the time you read this. Included in an electronic library of Amiga documentation, product updates, and bug reports, electronic mail and conferencing facilities, marketing and sales information, and downloadable sample programs. Cost is $15 per hour from 7 a.m. to 6 p.m. and $7.50 per hour from 6 p.m. to 7 a.m. and weekends. There is no signup fee or monthly minimum, and no 1200 baud surcharge.

Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380 (phone: 215-431-9100).

PHONE LINE PROTECTOR

Hy-Tek's *Exclude-A-Phone* will block an extension phone from interfering when the line is already in use; that is, when someone picks up an extension while your computer is online, neither they nor your computer will hear anything. In some situations, this may eliminate the need for a dedicated line for modem use. The device snaps easily in, or can be installed out of sight.

Hy-Tek also manufactures *Tap Detector*, which signals with a red light and an audible tone when someone has intruded on your line.

Hy-Tek, c/o R.K. Burtchaell Co., 516 S.E. Morrison, Suite 201, Portland, OR 97214 (phone: 800-342-5752 or 503-236-5775).

MUSIC PROGRAM

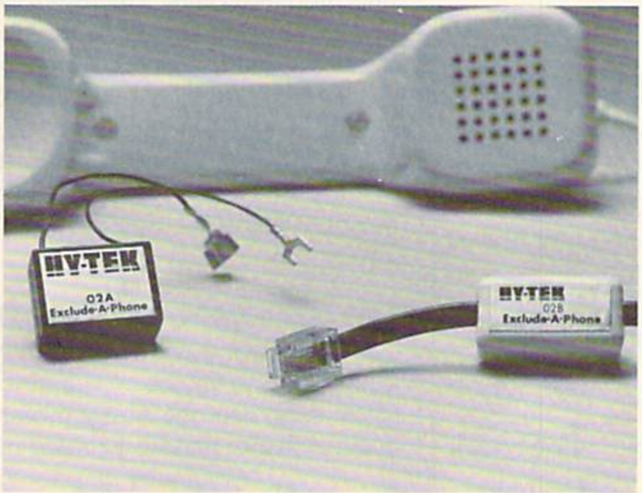
Music Magic allows C-64 users to create music by selecting notes and rests and dropping them on the grand staff. Notes and rests can be added, deleted, or replaced, and the entire composition saved to disk or printed out. Beginners can learn about music by changing the tempo and instruments of the songs included on the disk. Price is $25 (IA residents add 4% sales tax).

Dayline Software, P.O. Box 305, Ames, IA 50010.

NEW GAMES

If you never saw Imagic's *Touchdown Football* ($29.95), released about a year ago for the C-64, it's because the game never received wide distribution. It has now been picked up by Electronic Arts, and should be coming to a software dealer near you. The game's hi-res graphics simulate such details as blocked kicks, special team play, cheerleaders, and victory dances in the end zone. Hundreds of play combinations are built in, including seven possible line formations, three blocking styles, and eight different pass patterns for each receiver.

Also available from Electronic Arts is *Europe Ablaze* ($49.95), a historical simulation and strategy game for



Exclude-A-Phone can be used at home to isolate a modem while online. The unit operates off the phone's electric power, eliminating the need for batteries or AC power. READER SERVICE NO. 237

The Walker

1) Insert your COMAL disk in drive*.
2) Type LOAD "C64 COMAL*",8
3) Type RUN (starts COMAL)
4) Type AUTO
   (COMAL provides the line numbers)
5) Enter the program lines shown below
   (COMAL indents lines for you)
6) Hit RETURN key twice when done
7) Type RUN
   Watch an animated sprite hobble across the screen. Change the (99) in line 450 for really fast walking

```
0010 setup
0020 repeat
0030   walking
0040 until key$="q" //Q to Quit
0050 //
0060 proc setup
0070   blue:=14; pink:=10
0080   white:=1; black:=0
0090   define'images
0100   repeat
0110     input "speed (1-10): ": speed
0120   until speed>=1 and speed<=10
0130   background black
0140   setgraphic 0
0150   spriteback blue,pink
0160   spritecolor 1,white
0170   spritesize 1,false,false
0180   plottext 1,1,"press q to quit"
0190 endproc setup
0200 //
0210 proc define'images closed
0220   dim shape$ of 64, c$ of 1
0230   shape$(1:64):=""
0240   shape$(64):=chr$(1)//multicolor
0250   c$:=chr$(0)
0260   for x=22 to 63 do shape$(x):=c$
0270   c$:=chr$(170)
0280   for x=1 to 21 do shape$(x):=c$
0290   define 0,shape$
0300   c$:=chr$(20)
0310   for x=22 to 42 do shape$(x):=c$
0320   define 1,shape$
0330   define 3,shape$
0340   c$:=chr$(60)
0350   for x=43 to 63 do shape$(x):=c$
0360   define 2,shape$
0370 endproc define'images
0380 //
0390 proc walking
0400   for walk:=1 to 319 div speed do
0410     x:=walk*speed
0420     y:=100+walk mod 4
0430     spritepos 1,x,y
0440     identify 1,walk mod 4
0450     pause(99)
0460   endfor walk
0470 endproc walking
0480 //
0490 proc pause(delay) closed
0500   for wait:=1 to delay do null
0510 endproc pause
```

* If you don't have COMAL yet, order a Programmer's Paradise Package-$19.95. It includes the complete COMAL system plus over 400 pages of information. Add $5 more to get our 20 interactive lesson Tutorial Disk. Add $2 shipping. Visa/MC or US funds check accepted. Send to:

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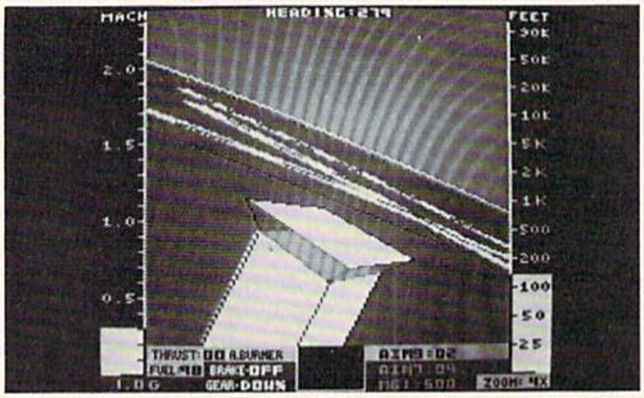
phone 608-222-4432 **Reader Service No. 258**

the 64 that recreates the air war over England and Germany between 1939 and 1945. Up to 12 players can assume the roles of top Allied and Axis air commanders during the war's crucial air battles, in one of three scenarios: Battle of Britain, Night Missions over Germany—1943, and Piercing the Reich—1944. A fourth scenario, Mediterranean Operations, is a tutorial that helps the player learn to use the built-in Game Design Kit to create variations or original scenarios.

Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403 (phone: 415-571-7171).



Jet *will simulate either a land-based F-16 Fighting Falcon or a carrier-based F-18 Hornet. Included is a free-flight non-combat mode. READER SERVICE NO. 238*

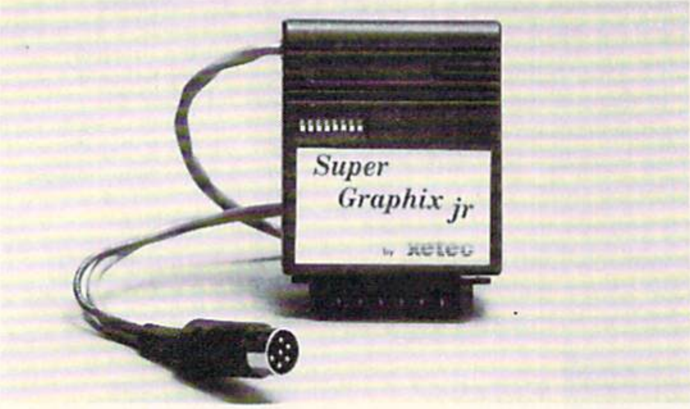
Pre-announced in last month's *Entertainment Software Section, Jet* ($39.95) simulates both a land-based F-16 Fighting Falcon and a carrier-based F-18 Hornet. The program includes a free-flight non-combat mode, and a variety of land/sea strike or dogfight options. Either aircraft can be filled with a variety of types of weapons (air-to-air missiles, AGM missiles, or smart bombs), depending on the mission selected. *Jet* is compatible with all SubLOGIC Scenery Disks, or can load scenery directly off the *Flight Simulator II* disk.

SubLOGIC Corporation, 713 Edgebrook Drive, Champaign, IL 61820 (phone: 217-359-8482; orders 800-637-4983 except in IL, AK, HI).

Designed for use by groups in a tournament atmosphere, *Halley-Scavengers* allows up to 10 players to compete to identify and retrieve Halley's comet trivia items. Ten scavenger hunt competitions are included on the $99 diskette; *Halley-Scavengers2*, a disk of ten additional competitions, is available for $49.

Little David Enterprises, P.O. Box 91, Fairless Hills, PA 19030 (phone: 215-943-0770).

Super Graphix jr.



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Reader Service No. 274

FRENCH SCRABBLE

Equipped with a built-in 20,000 word vocabulary, *Micro SCRABBLE* ($39.95) allows C-64 users to play the famous board game in French. One person can play against the computer, or up to four can compete against one another, on one of four different skill levels. If a player uses a word not among the program's 20,000 choices, the computer challenges the player and asks him to check the word with a dictionary.

Gessler Educational Software, 900 Broadway, New York, NY 10003 (phone: 212-673-3113).

HOME INVENTORY

What's Our Worth? ($19.95) enables C-64 users to inventory their personal belongings in preparation for a possible insurance claim. The completely prompted program lets the user enter, delete, and read items, search for specific information, or make a backup disk. Despite the program's ease of use, a 20-page manual is included.

Adita Enterprises Inc., 116 Bermondsey Way N.W., Calgary, Alberta, Canada, T3K 1V4.

HIGH PERFORMANCE TABLET

We're certain that our *Art Gallery* (see page 32 in this issue) will never be the same once the Amiga owners in our audience muscle their way in.

Continued on page 67

AHOY!TERM 128

A Terminal Emulator for the C-128 or C-64

By Jeffrey Lih

Ahoy!Term 128 is a Hybrid TTY machine language/BASIC terminal emulator program designed for the Commodore 128. It is menu-driven and has baud selection, autodial, duplex selection, text upload/download, and assorted file manipulation commands available. The text upload/download file size is only limited by the amount of disk space available.

We did not attempt to include X-Modem or CompuServe protocols for program transmission because there are several good programs around that do, and the timing of the particular machine becomes all-important.

The program is designed for the C-128 in 80-column mode at 1200 baud. But it also works nicely on the C-64 at 1200 baud, which is something that *Term-64* (which came with the 1650) won't do. It will even work on the 64/C-128 64 mode using 80-column software screen display as long as you stay at 300 baud.

We put all the OPEN and CLOSE statements in the BASIC program so that baud rate, parity, printer specifics, and disk parameters could be easily changed. The idea is to let machine language do what has to be done in "REAL TIME", and let BASIC do the other tasks. This lets you change things to be the way you want them.

If you want the default baud rate to be 300–DO IT.

If you want the program to automatically dial a phone number–DO IT.

If you want to DOWNLOAD to device #9...well, I'm sure you have the idea.

The M/L part is written in assembly language and uses the Kernal jump tables to get around. It does not use any machine specific POKEs to make life easy.

M/L handles communications and buffer control. It has its own BUFFER menu that lets you LOAD from disk, SAVE to disk, DISPLAY on screen, PRINT on your printer, OPEN (capture "ON"), CLOSE (capture "OFF), TRANSMIT to the host, and of course CLEAR it. When the BUFFER menu is displayed, you are shown how many bytes have been used and how many remain. If you take the print or view option, you may cancel it by typing a "COMMODORE B" (for BUFFER menu), which is how you got into the buffer menu in the first place.

The buffer itself is less than 18000 bytes long (17664), but this is no problem. When you are receiving text, the amount of remaining space is continuously monitored, and when the buffer is just about to fill completely, a CNTRL-S (stop) command is sent to the host, the buffer is saved on disk, reset, and the host told to continue (CNTRL-Q). This is all automatic.

When you are uploading a huge file (bigger than 68 blocks) you load the buffer with as much as it will take (68 blocks) and take the transmit option on the buffer menu. When it finishes sendnding the buffer contents, you select the buffer menu again, clear it, and tell it to load. The load picks up where it left off, and you can continue with the transmission. You may repeat this as many times as you have to. You can even come back up to the main menu and change your input file name and send additional files appended to the first one(s).

We control the machine language portion of the program with a BASIC program. This program is set up to use the new Commodore 1670 MODEM-1200.

The BASIC program dials using Hayes protocol, sets baud rate, and allows you to change names of your input and output files. Actually, you'll find it to be a full-featured, easy to use (menu-driven) terminal program unlike anything else available.

The program is menu-driven, and is set up to be as easy to use as reasonably possible, but you may want to tailor it a bit to make it suit your specific needs.

As it stands now, when the program is loaded and run, it loads the M/L portion (TERM.ML), and then sets things up with the files that it needs. It looks for an upload file named "ZZUP" unless you tell it otherwise, and if it doesn't find it, creates a dummy version. It also sets up a default download file named "ZZDOWN", which you will be prompted to rename whenever you exit from terminal mode.

Baud rate gets set to 1200, and bits and parity are standard Telenet/CompuServe style commercial settings. Once everything is all set up, the MAIN MENU is displayed giving you the choice of going directly to TERMINAL mode, using MODEM commands (separate menu), or using FILE commands (separate menu). If you have data that you want to transmit, you can select the FILES option and take the "Change UP/DOWNLOAD Name" option. You can change disks and specify your file name when the prompt tell you to.

Now it is time to actually establish a connection. With the 1670 MODEM-1200, pick MODEM on the main menu and follow the DIAL prompts. If you have a different modem, you will have to dial manually or write a dialer routine. Sorry, but the MODEM 300 is not supported here.

INSTRUCTIONS FOR ENTERING

The machine language portion may be entered using *Flankspeed* (see page 96) or the machine language monitor available in the C-128. If using *Flankspeed*, you must be in C-64 mode. Be sure to save the program as TERM.ML. Also, it must be saved on the same disk as the BASIC portion of the program. If you decide to enter in the machine language portion using the C-128 monitor, be sure not to enter the ninth column. The ninth column is used solely by *Flankspeed* for checksum purposes.

The BASIC listing may be entered in C-64 mode and checked using the *Bug Repellent* for the 64.

In addition to testing with the 1670, we also used the 1600, 1650, the Mitey Mo, and an Anderson AJ-1234A with an Omnitronix RS-232 interface (all of which we dialed manually).

Once you have carrier, select option T from the main menu and you are in TERMINAL mode. Pressing the COMMODORE key and S (C=S) will cause a pause on any standard XON/XOFF host, a COMMODORE B (C=B) will bring up the buffer menu, and a COMMODORE X (C=X) will bring you back up to the BASIC program's MAIN menu. You can return to terminal mode and go back and forth as you wish without messing anything up as long as you follow the prompts.

Special note to C-64 owners: the M/L program works as it is on your machine–no changes. The BASIC program, however, will need a little attention. We have disabled RUN/STOP, so change the POKE values to location 808 in two places.

REM out the BANK 13 statement–you don't need it anyway, and REM out the DIRECTORY statement in the FILE section.

The BASIC program essentially has all the bells and whistles. Be very careful when you change it. It is a tight fit on the 128 to keep it under where the machine language program starts. We suggest that you use the monitor and check locations $3000 for fit. This warning does not apply to the 64. The BASIC program area starts much higher up in memory on the 128. The 64 has loads of room.

By the way, you may notice a very strange looking OPEN statement for the modem when specifying 1200 baud operation. This is from the Commodore Modem-1200 Manual. It seems that 1200 baud operation really isn't exactly 1200 baud. It is more like 1219. This method of opening allows a fine tuning of speed. Don't be afraid of changing the third number (CHR$(65)) in the program, adjusting it up and down until you get perfect transmission with no garbling of characters at all. A value of 65 works for me in 128 mode, but I change it to 64 when in 64 mode. You should find the "perfect" value somewhere between 57 and 68.

There are two other little customizing tricks that you can use. The first is to POKE position 12296 (POKE 12296,120). Changing the value in location 12296 controls your keyboard sensitivity. The lower the number, the more sensitive the keyboard is. If you make it too sensitive you will get key bounce like you have never seen before. The other POKE found in the program is location 12294. This location holds a pacing factor that controls uploading speed. The lower the number the faster the speed. Too fast will cause garbage to appear on the screen because the host computer can't keep up. The BASIC program adjusts this location when you change baud rate.

For those of you who want to write your own BASIC driver program, I would like to give you a few insights on what the M/L program expects.

Logical device 2 opened as keyboard input, paced by a countdown value in decimal location 12296.

Logical device 3 is the screen, and 4 is the printer. I don't change anything with opens and closes, so if you send an escape sequence for printer setup it shouldn't be disturbed.

Logical device 5 is RS-232. I have tested the program up to 2400 baud and feel that it will go higher, perhaps to 4800 in fast mode on the 128. The program strips out two values that may be received on the RS-232 from the host or sending computer. The first is zero (0) which I use to indicate no data. The second is decimal ten (10) which is a linefeed that usually precedes a carriage return. All other values get through. They are translated by tables at hex locations $3800 and $3900. The one at $3800 is used to translate the incoming byte to Commodore ASCII, using the incoming byte as an index to the entry in the table, extracting the value from the table, and showing it on the screen. The table at $3900 is used the same way to translate Commodore ASCII to standard ASCII by using the outgoing byte as an index, extracting the corrected value, and sending that. Transmission (sending the buffer contents) also has a change made to the data. My normal text transmission is to a mainframe computer using the mainframe's EDITOR in input mode to capture my data. When the mainframe's editor sees a carriage return with no data before it, it kicks out of input mode and causes all kinds of havoc. The fix is to precede all carriage returns with a blank, which is exactly what the M/L program does when in transmit mode.

Logical devices 8 and 9 are the upload and download files. Once again the M/L doesn't close and reopen anything, so what you do in the driver should hold. Reads and writes are all done through the Kernal's CHARIN and CHROUT routines ($FFCF and $FFD2).

There is a duplex control switch found at $300A. This is tested, and if it contains zero no echo takes place (full duplex). If it contains a one, all keyboard entries go to the screen as well as to the RS-232 (half duplex). This is useful for Commodore-to-Commodore communicating. Watch your program size, once you hit 20 blocks on disk you are on thin ice.

I would like to thank Morton Kevelson for suggesting this article and Mike Davila for wanting the "bells and whistles"–it made for a much better program. ☐

SEE PROGRAM LISTING ON PAGE 110

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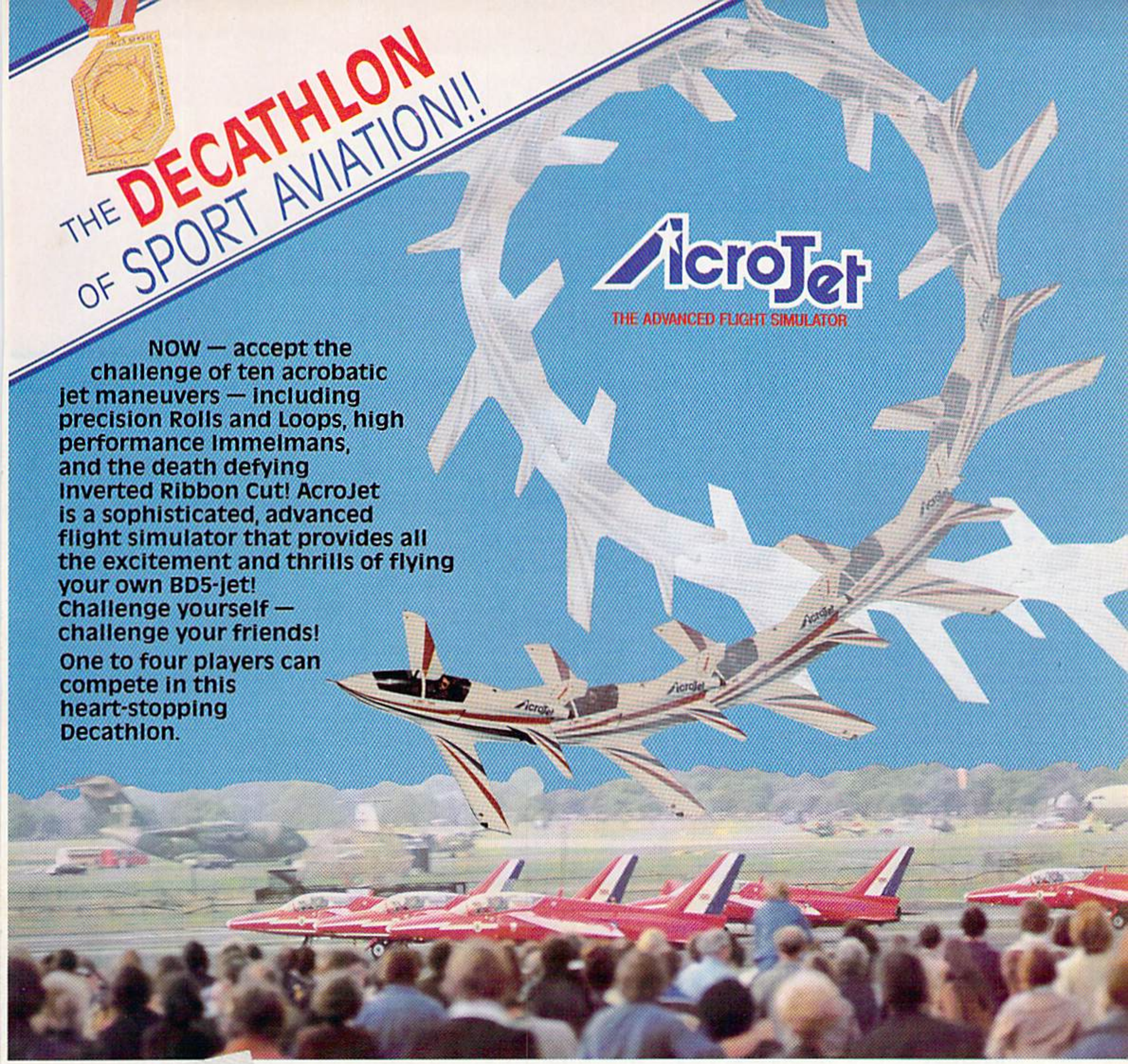
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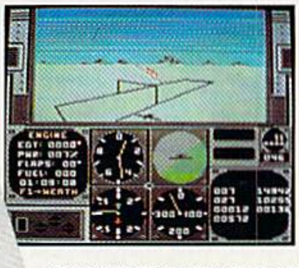
ENGINE
EGT: 0000°
PWR: 007%
FLAPS: 00°
FUEL: 000
01:09:08
F1→WEATH

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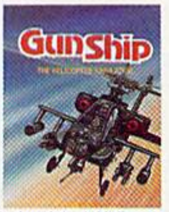

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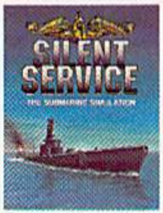
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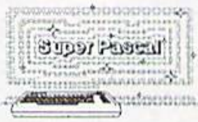
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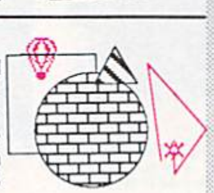

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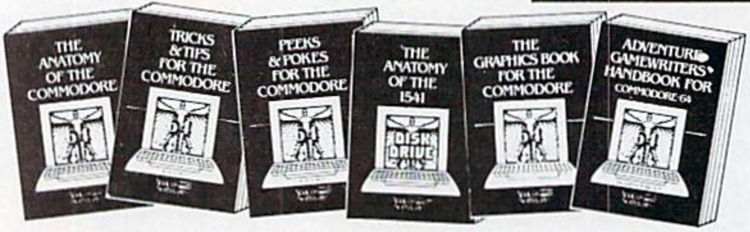
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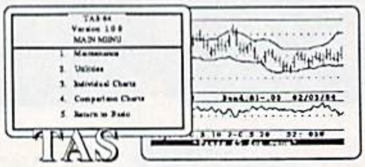

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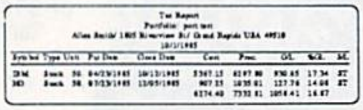

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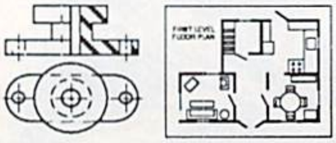
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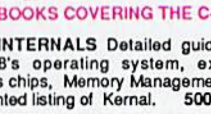

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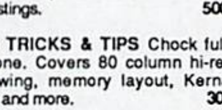

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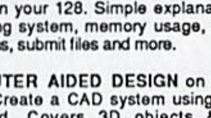

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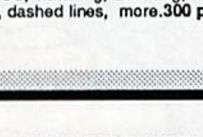

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Ahoy 3/86

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To some people they looked like brain tools, devices that could extend their reach, tighten their grasp, and speed up the thoughts of their own minds. Scientists could perform experiments that before they could only imagine—and could imagine things that were previously unthinkable.

To some people they looked like fantasy machines, which would let them live in places that were never within their reach before. Game players found new worlds to explore and conquer, winning victories on playfields that had once existed only in fiction, but now moved across a screen under their control.

But to most people who used computers at all, computers looked like slaves. They would do the dirty work for us, and because they were just machines, they wouldn't even care that they were being exploited.

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We all enjoy those electronic slaves, don't we? They don't mind sitting there doing the same tedious, boring tasks over and over again, while we go off and play games or (is it possible?) talk to each other. Computers control the shifting of gears and report the fuel level in our cars. They shout out our purchases at the grocery store and then announce our final bill to all the other shoppers. Think of it—grocery store checkout clerks are steadily becoming baggers.

No, no, this isn't a spiel about automation causing human misery, or how computers are dehumanizing us. I'm just pointing out that computers are doing what slaves have always done—human work. And we all take advantage of it wherever we can.

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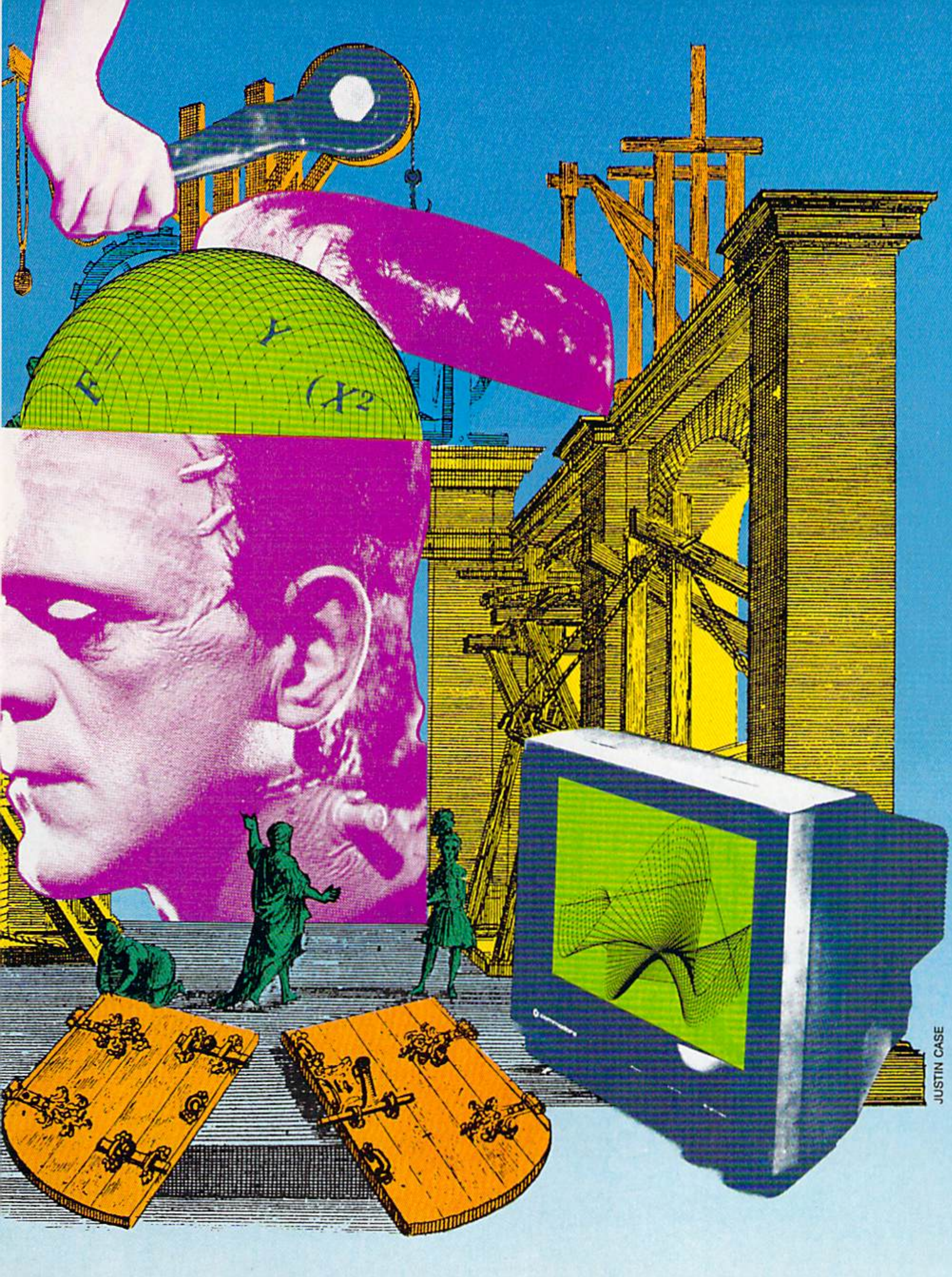

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PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
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Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec*	21 sec
Hitchhiker's Guide to the Galaxy (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = *Failed to load at all.*

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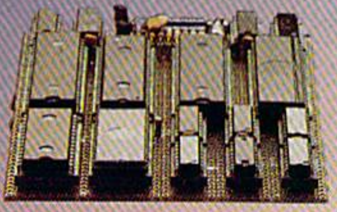

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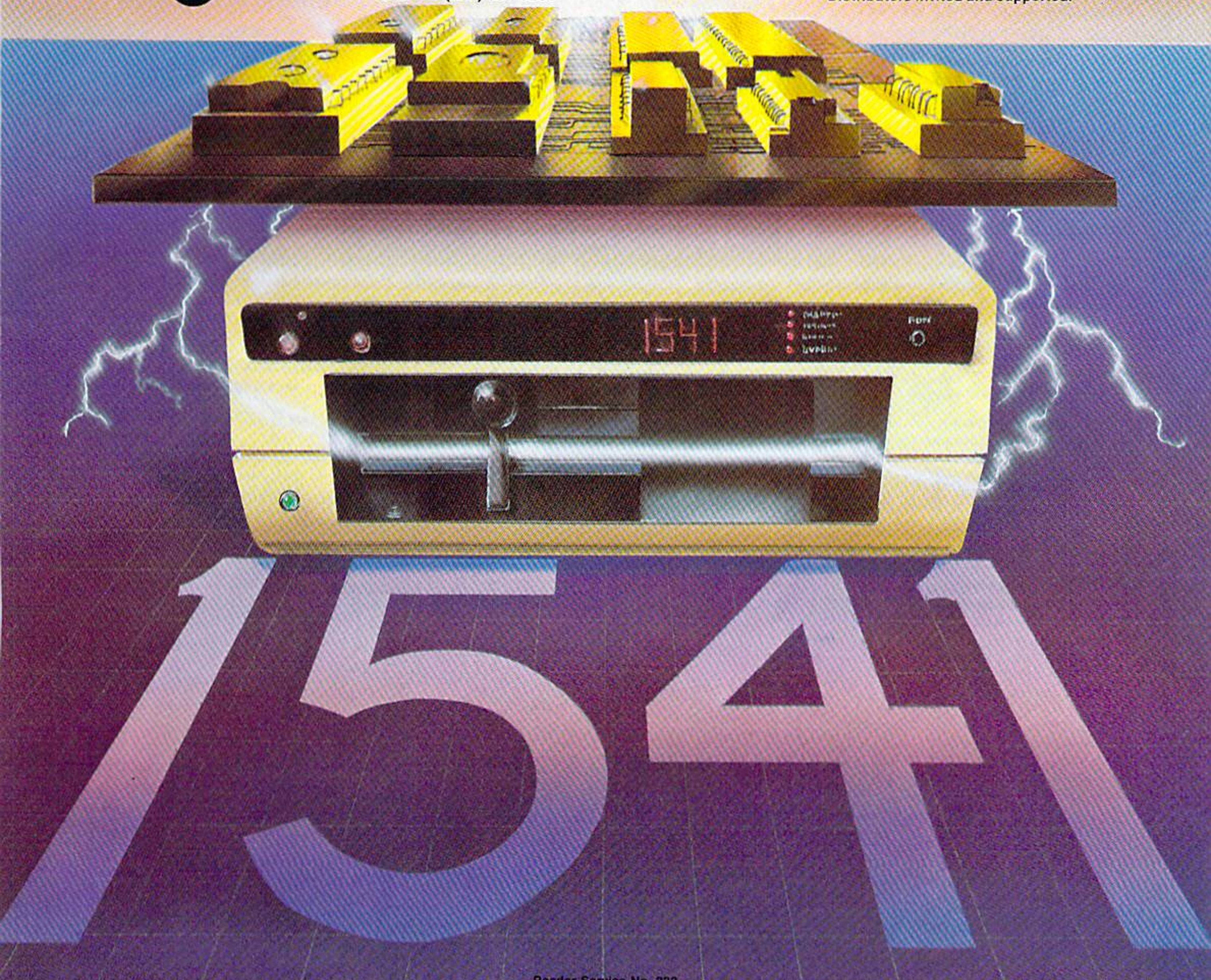

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Parents thought that they could give their kids an advantage by bringing the computer home and letting it be a kind of private tutor. After all those silly, guilt-inducing Commodore ads that as much as said your kid would flunk out of college without a 64, how many of you have seen anybody in your family learn the equivalent of one college course in a non-computer subject? Come on, raise your hands. There should be, oh, dozens of you. (Raise 'em higher. I can't see you.)

Naturally, teachers didn't think *replacing* teachers was possible—but they did like the idea of letting the computers do the slavery. Grading papers. Giving tests. And, above all, doing the drill work.

So much of the educational process, after all, is not a matter of getting ideas into children's heads. Rather it's a matter of getting habits ingrained in children's brains. The whole point of arithmetic drill is not for the child to learn the rational relationships of numbers. (The New Math of my childhood was an attempt to do so, but it was both needless and misguided.) Rather, the point of it is for the child to become a machine.

When the symbols 2x9 appear, the child's brain must immediately reply with the symbols 18—with *no* rational thought intervening. When the years 1066, 1492, 1776, and 1929 appear they should instantly bring to mind the Norman Conquest, the Discovery of America, the Declaration of Independence, and the Stock Market Crash. The symbols H, He, O, C, Na, and Xe should instantly conjure up Hydrogen, Helium, Oxygen, Carbon, Sodium, and Xenon—and, ideally, our brain should automatically arrange them in order by molecular weight.

All right, I admit that most of us probably don't do all these things unerringly anymore. But the point is that some things, some very important things, are in fact habits that must be learned by repetition. And the teacher, to teach them, must do them over and over and over again. You know the technique. Flash cards. Quizzes. Recitations.

I can hear you. Or at least I can see your lips moving. "Dull," you said, right? (If you don't want me to read your minds, don't move your lips when you think.)

That's the cliché, isn't it? This stuff is boring. It's boring to the students. It's boring to their parents. Above all, it's boring to the teachers.

After all, the students finish first grade and go on. But the poor teachers do first grade over and over again.

Can you blame them for thinking that maybe the computer could take over all that dull stuff for them?

The trouble is that computers aren't good replacements for teachers. They're merely good replacements for chalkboards and paper and even some books—all the *tools* of education.

The result of the misconception that computers could take over the duties that bored the teachers is that almost every computer education program I've seen or heard of is so excruciatingly dull that no sane child would waste a minute on it.

LEARNING IS NOT DULL

I say that's a crime. Not only a crime, a stupid crime. Because learning itself is vitally interesting to children. Or rather, especially to children, because it is also exciting to adults.

Maybe you can't remember. Maybe you'll have to spy on a child for a while to see what I mean. For instance, I have a little boy with cerebral palsy. At the age of two, he's just learning how to get his arms and legs to go where he wants them, how to manipulate the part of the world that is actually attached to him.

Now, if you adults spent half an hour lying on your backs, just practicing lifting your legs straight up and letting gravity roll you over on your side, let's just say that the excitement would wear off well before the half hour was over.

Why? Because it's ridiculously easy for you. (Maybe the leg-lifting part is hard, but that just means you're out of shape.) You've been able to do that since you were—what, two, three months old?

But for Charlie it's a triumph. When he does it, when he actually rolls over in the direction he wants, he laughs and crows and yells and generally demands congratulations.

Now, every kid does that. But most of them do it at such an early age that they really haven't learned how to communicate their excitement to adults. By the time they can talk, things like rolling over aren't exciting anymore. They're just a normal part of life. But because Charlie is learning it's later, he's accomplishing this "boring" stuff at a time when he can communicate with us. In fact, he's doing it at an age when showing off to their parents is still the most fun kids can have. (Later, all they want to do is show off to their friends. That's OK—you don't actually need to lock them up until they want to show off to members of the opposite sex.)

The point of this is that repeating a task is dull when you've already learned it. But it isn't dull when you are in the process of mastering it.

There's an opposite problem, of course. Things can also be dull when they're too hard—when somebody's trying to teach you something that you're not ready to learn. You've seen how it goes. You try to try to teach a kid something, and he never gets it. Six months later, without any practice at all, the kid goes out and does it in a few tries.

Some childhood development researchers talk about "windows" in a child's life. Try to teach the kid something when he isn't ready, and he'll hardly make any progress. The more you insist, the angrier and more frustrated he gets. During the "window," when the brain seems ready for the information or the skill, learning is rapid, even astounding. Then, later, try to learn a similar skill, and the window is closed. It's painful and time-consuming again.

Language, for instance. Just try teaching a three-month-old to talk. Repeat words over and over. What do you get? Maybe he said "Mama," or maybe he was making funny sounds, or maybe he has gas. Then, suddenly, the floodgate opens and you can't get the kid to shut up. Language? In a year or two they learn the whole thing—as much of it as applies to their lives. Sophisticated rules of grammar. (Advanced vocabulary will come when they need it.) And they don't learn it by comparing this new language to one they knew before—they learn the rules of grammar just by listening and trying things out.

But now take a college student and try to teach him another language. It should be much easier now—they've already learned *one* language. Instead, however, we discover that the seemingly effortless, "natural" method of language-learning that children use, the method that seems like—that *is*—play, it's lost

Continued on page 68

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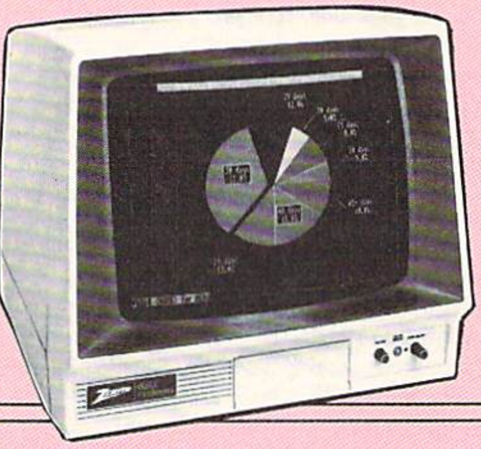

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Size/Weight
Height 5.04" Width 16.7"
Depth 13.4" Weight 18.7 lbs.
Internal Char. Coding
ASCII Plus ISO
Print Buffer Size
120 CPS: 132 Bytes (1 line)
120/160 CPS Plus LQM: 2K
No. of Char. in Char. Set
96 ASCII Plus International
Graphics Capability
Standard 60, 72, 120 DPI
Horizontal 72 DPI Vertical
Pitch
10, 12, 16.7, 5, 6, 8.3, Proportional Spacing
Printing Method
Impact Dot Matrix

Char. Matrix Size
9H x 9V (Standard) to 10H x 9V
(Emphasized & Elongate)
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Forms Type
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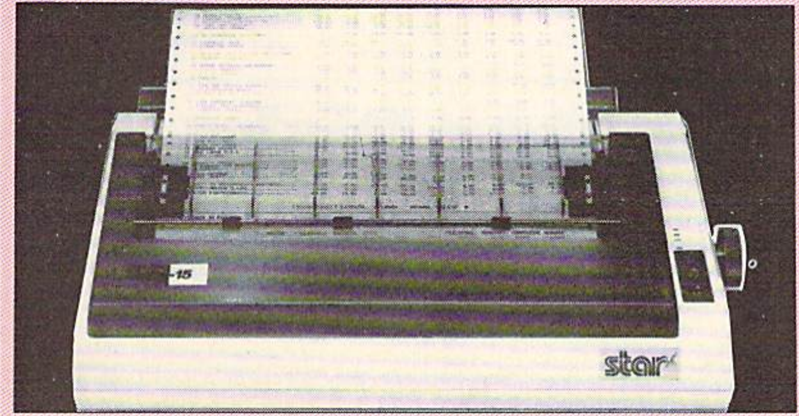

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(IBM — Commodore) **(Apple — Atari — Etc.)**

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Number of Columns
136, 164, 232 (68, 82, 116 Double Width)

Character Fonts
Normal (10 CPI); Elite (12 CPI); Condensed (17 CPI); Enlarged (5, 6, 8.5 CPI); Emphasized; Double Strike; Super & Sub Script

Character Sets
96 Standard ASCII, 32 Block Graphic, 96 Italics Characters

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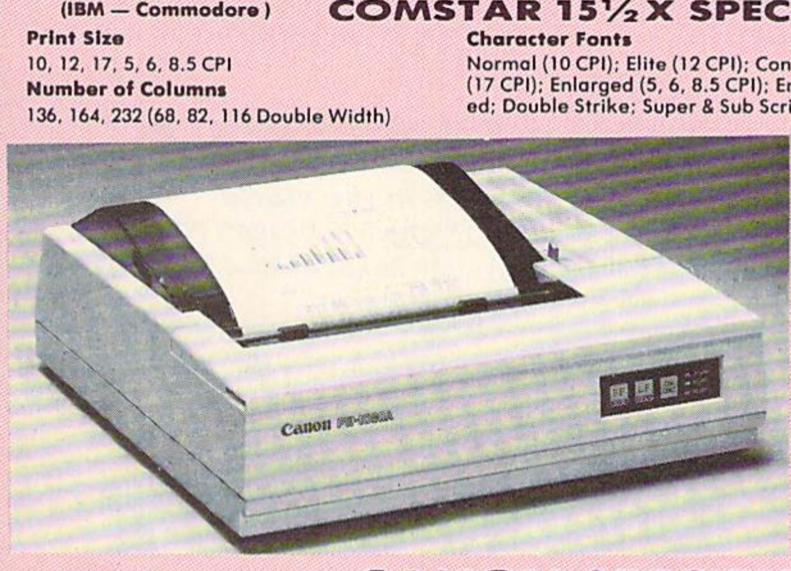

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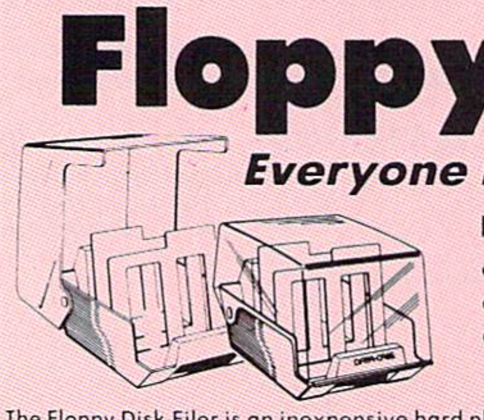

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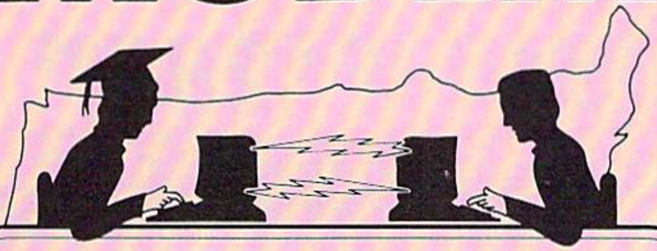

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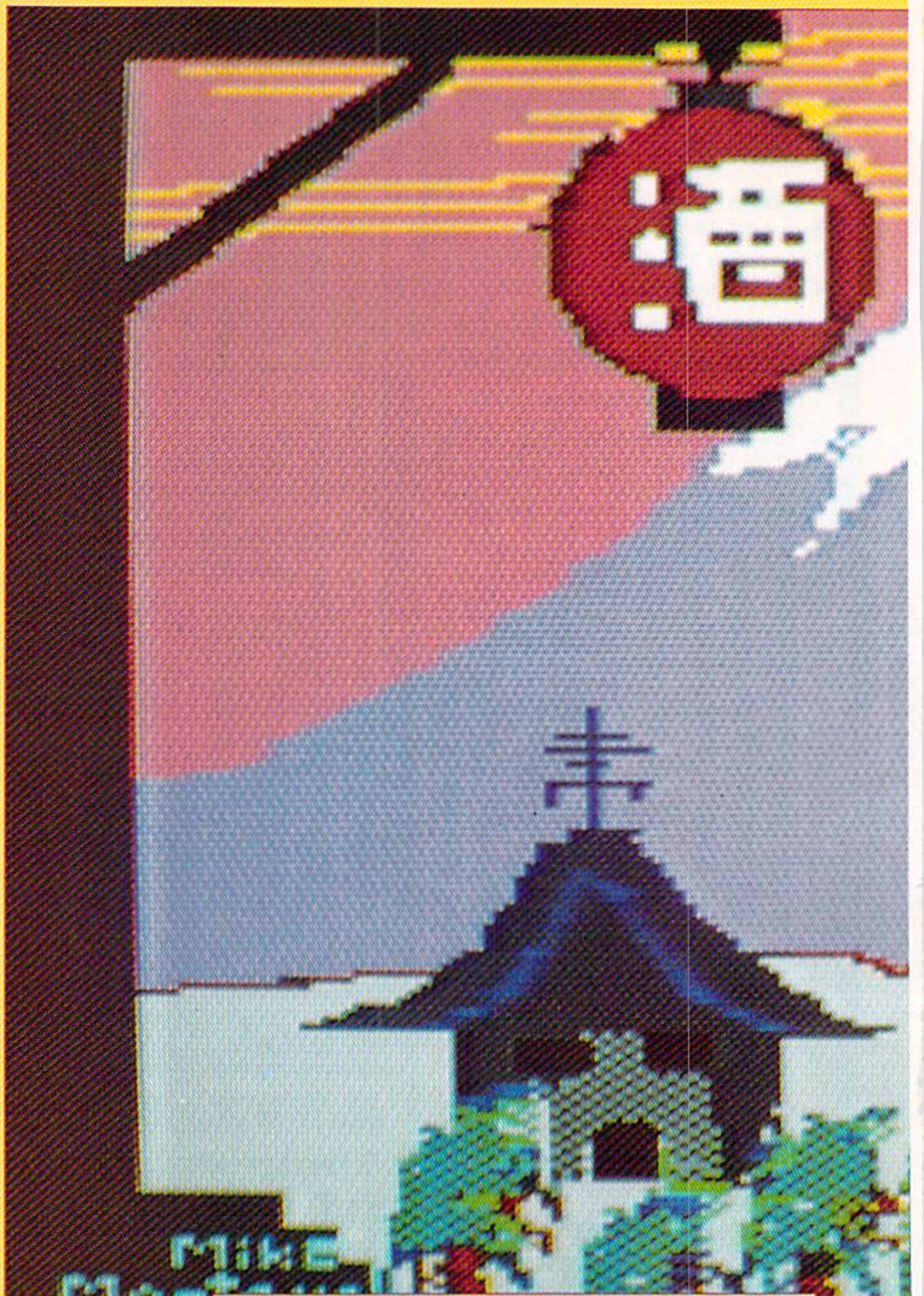
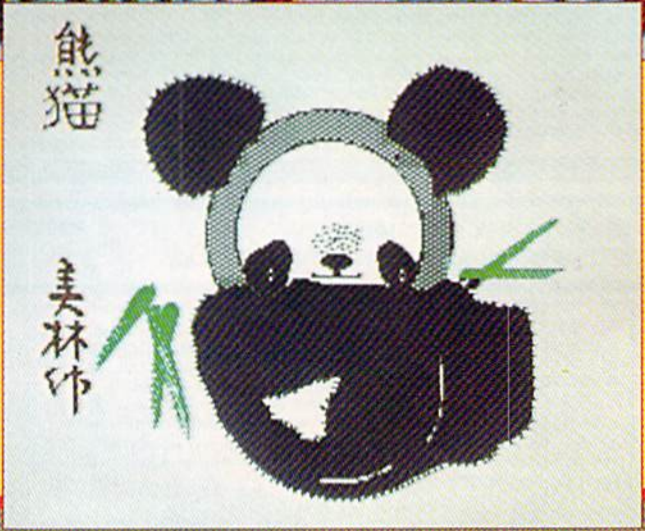
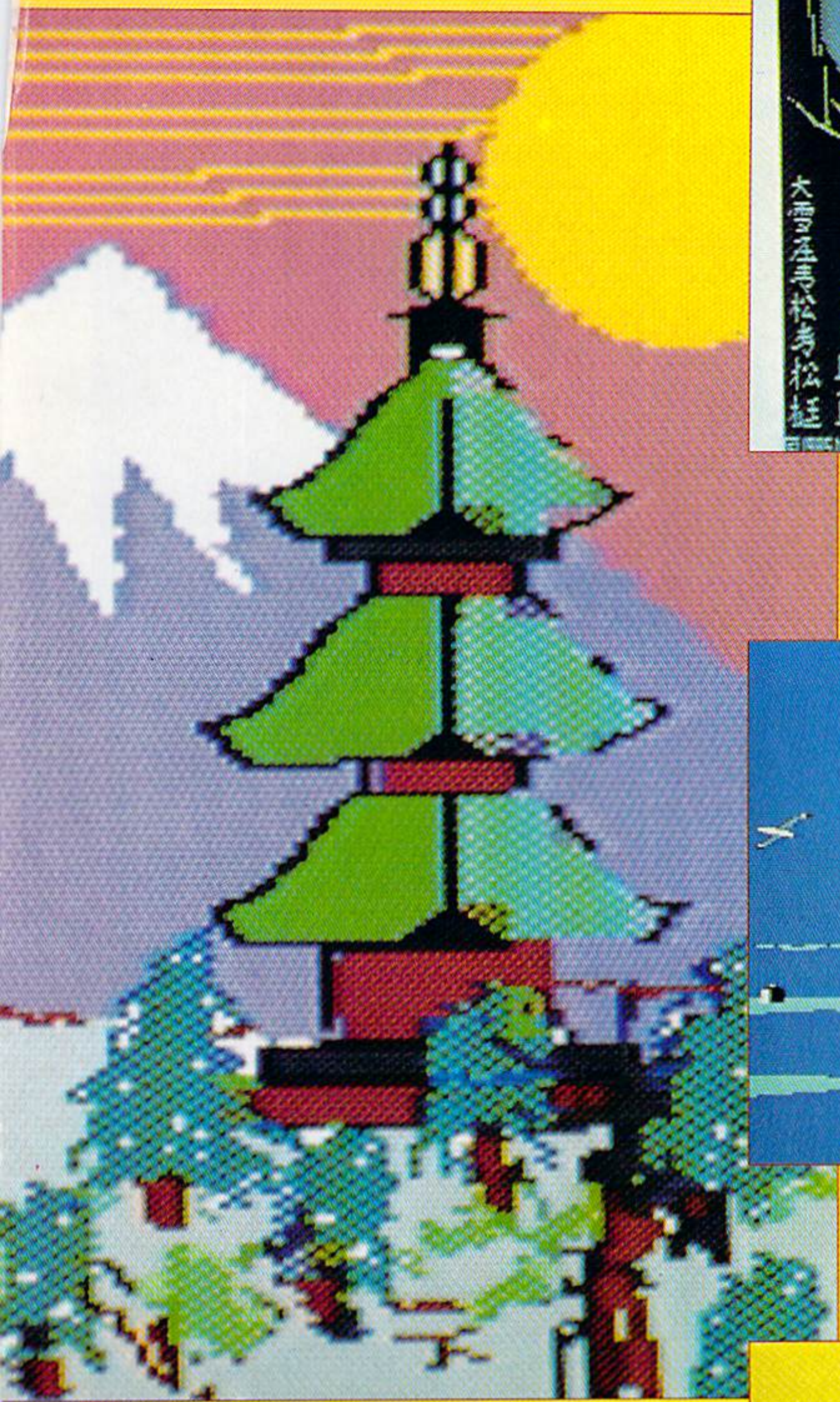
Contributors to *Ahoy!'s Art Gallery* will receive royalties based on the sale of disks. Send your best work on disk, accompanied by a stamped and self-addressed mailer, to Morton Kevelson, P.O. Box 260, Homestead Station, Brooklyn, NY 11229. Indicate the drawing package that was used to create the image. If you employed a bit map of your own design, indicate the appropriate file parameters, i.e., hi-res or multicolor, location of bit map, screen or color data.

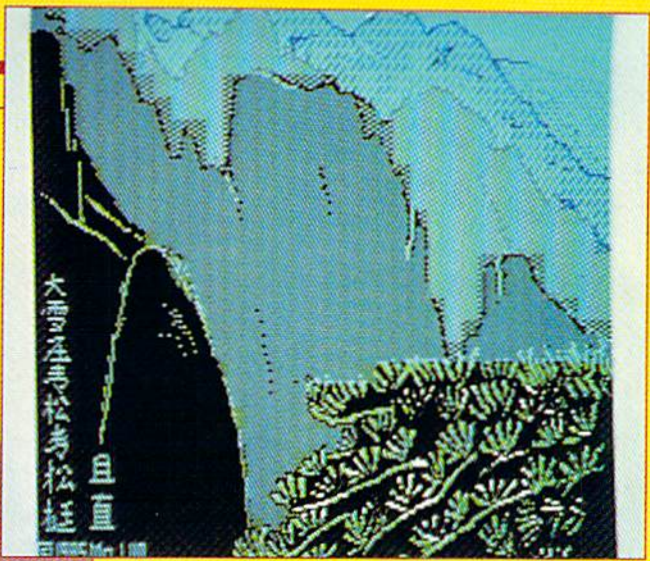


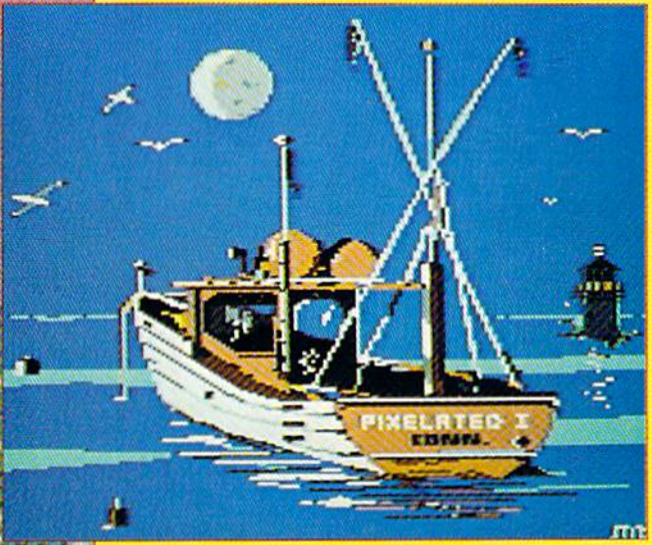
January's *Art Gallery* had an Italian motif. This month we continue around the globe to the Orient, landing in Michael Montauck's *Japan* (the central image of this installment). This is the Brooklyn-based artist's fourth *Art Gallery* contribution, rendered as usual on the Koala Pad with *Koala Painter* software. At bottom left and top right are *Panda* and *Qingsong,* created on Flexidraw by a genuine Oriental, Ma Luo. Mr. Luo is a Chinese student of entomology, pursuing a doctorate at the University of Manitoba. Certainly no Chinese junk, *Pixelate* (middle right) is by Joseph P. McCarthy (Trumbull, CT).

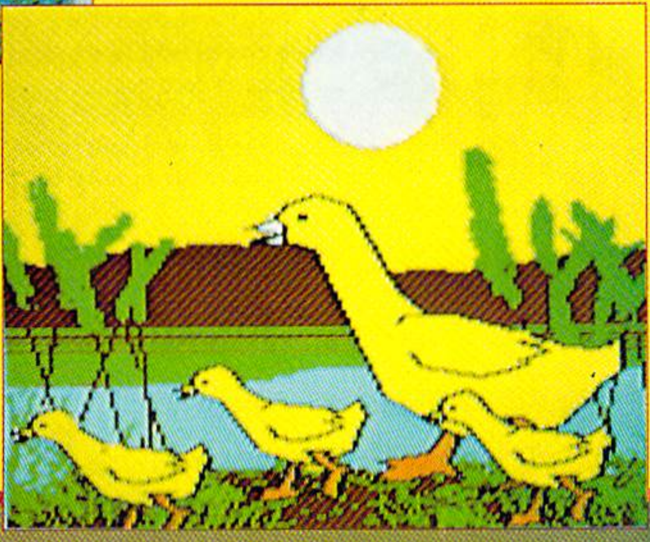




Mr. McCarthy is a former animator for Terrytoons. This image was drawn with the Koala Pad. At bottom right is *Ducks*, drawn on Koala by Wilfred Allen Sessoms (Bronx, NY). This one may seem out of keeping with our Oriental theme, but just imagine the little quackers smothered with Mandarin Orange sauce. Mr. Sessoms has been working with the C-64 for four years now—he must have been one of the first. He teaches computer graphics to children between the ages of 10 and 15 at the Bronx Museum of the Arts in New York City. Nationalities requesting equal time are invited to write us.

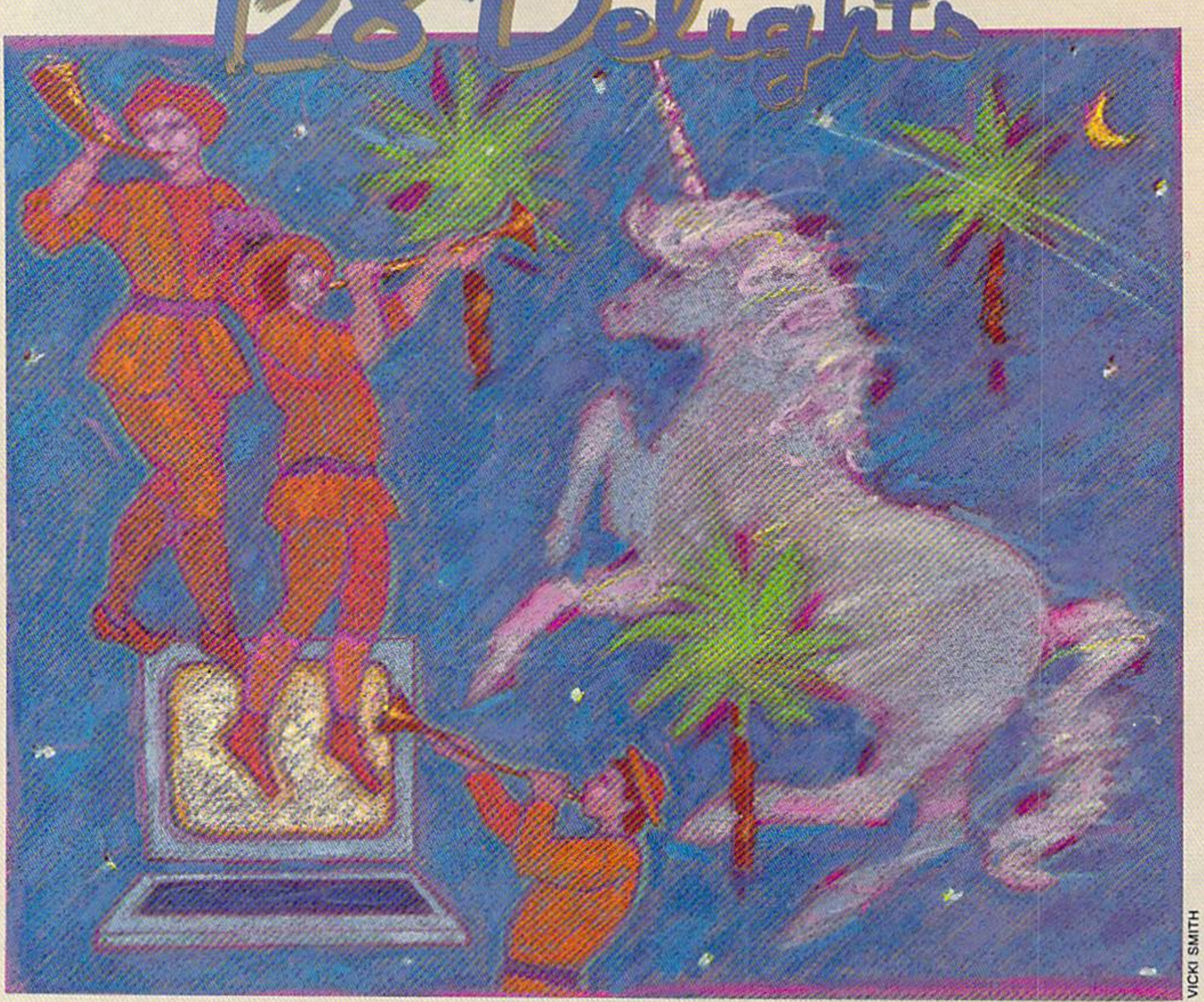






RUPERT REPORT

128 Delights



VICKI SMITH

Pleasures of Using the Commodore 128

Do you remember how impressive it was to use the full-screen editor of the Commodore 64 for the first time? Compared to the mnemonic- and mode-encumbered line editor of the TRS-80, for example, the C-64 seemed revolutionary. Perhaps you can also recall Commodore's advertisements with full-color displays, proclaiming movable sprites and three-part harmonies for the C-64. You imagined easily creating full-color, animated graphics displays, accompanied by a woodwind trio! That's where the disappointment began.

Unbeknownst to most potential purchasers was the incredible amount of tedious PEEKing and POKEing necessary to produce even the smallest beep from the sound generator, let alone to create and animate a sprite. Indeed, learning the intricacies of the sophisticated VIC-II video chip was an intellectual challenge, but I, for one, would not mind at all if I never had to POKE another value into it.

So much for reminiscences and disappointments. The Commodore 128 is here! Endowed with a BASIC worthy of the hardware it controls, the C-128 is a joy to use. This computer's hardware capabilities are readily accessible from its built-in high level language, BASIC 7.0.

Here, as a prelude to a series of *Rupert Reports* on the C-128, are some of the features which make the Com-

By Dale Rupert

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modore 128 such an impressive machine.

1. RUN “filename” loads and executes a program from disk.

2. DLOAD “filename” loads a program from disk. No more calling the tape recorder when I wanted the disk.

3. DSAVE “filename” saves the program to disk.

4. DIRECTORY displays just that. No more having to load the WEDGE afterthought in order to use simple disk commands.

5. Function keys come preprogrammed with useful commands such as DIRECTORY, DSAVE “, LIST, DLOAD “, and RUN.

6. Function keys are quickly and easily reprogrammed at any time with the KEY command. Just the way function keys should be.

7. POINTER (variable name) returns the memory location of the specified variable. Equivalent to VARPTR in other versions of BASIC.

8. CHAR ,X,Y,A$ locates the cursor at location X,Y and then displays the string A$.

9. DEC(“9B3F”) returns the decimal equivalent (39743) of the hexadecimal value 9B3F. Stop the search for the world's shortest hex-to-decimal converter program!

10. MONITOR (or simply function key f8) calls up a built-in machine language monitor. Still no breakpoints, but better than nothing and definitely convenient.

11. DO/LOOP and EXIT provide a very powerful, structured looping capability.

12. UNTIL or WHILE combined with the DO/LOOP structure will simplify some of those cumbersome FOR-NEXT sequences.

13. IF-THEN and, at long last (are you ready for this?), ELSE! The ELSE statement in itself is perhaps reason enough to buy the C-128. Anyone who disagrees has not finagled as many cumbersome, inelegant, leapfrogging IF-THEN (without the ELSE) loops as I have.

14. BEGIN/BEND allows the use of many program lines within an IF-THEN-ELSE structure. Truly a godsend. There is simply no excuse for cluttered, unfathomable program sequences with these powerful statements in BASIC 7.0.

15. SLEEP N causes the program to wait N seconds before continuing.

16. PRINT USING is another of the truly great and powerful additions to Commodore BASIC. It allows the programmer to specify the format of the displayed values, including the number of spaces and decimal places allowed. Strings may be centered or right-justified if desired.

17. GETKEY A$ waits until a single key has been pressed. Its value is stored in A$. A bit more elegant than 10 GET A$: IF A$=“ ” 10.

18. AUTO 10 toggles the automatic line numbering feature. After you enter your first program line, a line number ten greater than that is automatically displayed. Entering a blank line stops the numbering, and AUTO without a parameter disables it.

19. RENUMBER is another command which alone is almost reason enough to buy the C-128. Specify new and old starting line numbers as well as the increment.

20. DELETE 20-250 does just that. No more “20 <return> 30 <reurn> 40 <reurn> 50 <return>...”

21. HELP, either spelled out or with a press of the special HELP key, causes the previously encountered error in the program to be displayed and highlighted. Especially useful for finding bugs in lines with multiple statements, and statements with multiple arguments.

22. TRON/TROFF turn a trace function on and off. With the trace on, the sequence of executed line numbers is displayed as the program is run. Debugging might almost be fun.

23. TRAP allows the program to branch to a specific routine whenever an execution error is encountered. Now there is no excuse for programs that are not user-friendly and bulletproof.

24. The TRAP routine may analyze the type of error using the ER and EL variables. They indicate the error number and the line in which the error occurred. ERR$ (ER) returns the error message corresponding to error number ER.

25. RESUME in the TRAP routine allows the program to make a graceful recovery, respond properly to the error, and return to the appropriate part of the program.

26. The WINDOW command should generate some interesting applications. The top left and bottom right corner coordinates may be specified in which printing and scrolling are to occur.

27. Believe it or not, there is a built-in bell function! Now it is as easy as PRINT “<CTRL> G” to generate a pleasant beep.

28. The FAST command supercharges the computer, increasing its clock speed from 1 MHz (megahertz) to 2 MHz. Non-graphics programs run literally twice as fast in this mode as they do in C-64 mode. Unfortunately, the 40-column graphics screen disappears until the SLOW command restores the old clock rate.

29. SCNCLR may be used with or without an argument to clear either the current screen or any of the five other screen types available (40-column text, bit map, split screen bit map, multicolor bit map, split screen multicolor bit map, or 80-column text).

30. A fantastic NO SCROLL key pauses any program execution that involves a screen update. It also halts program LISTings in their tracks. Interestingly enough, program execution will continue in the NO SCROLL mode as long as output is not being written to the screen. Pressing NO SCROLL again (or almost any other key) returns the computer from its state of suspended animation.

31. The TAB key is handy for rapidly moving across an 80-column line during editing. Since TAB may be embedded within a string, it is no longer necessary to break a string into parts separated by commas in order to print tabular columns.

32. A nicely illustrated *Introductory Guide* quickly familiarizes both novice and whiz with the keyboard, components, and operating modes.

33. How about a genuine RESET button? Yep, it's there

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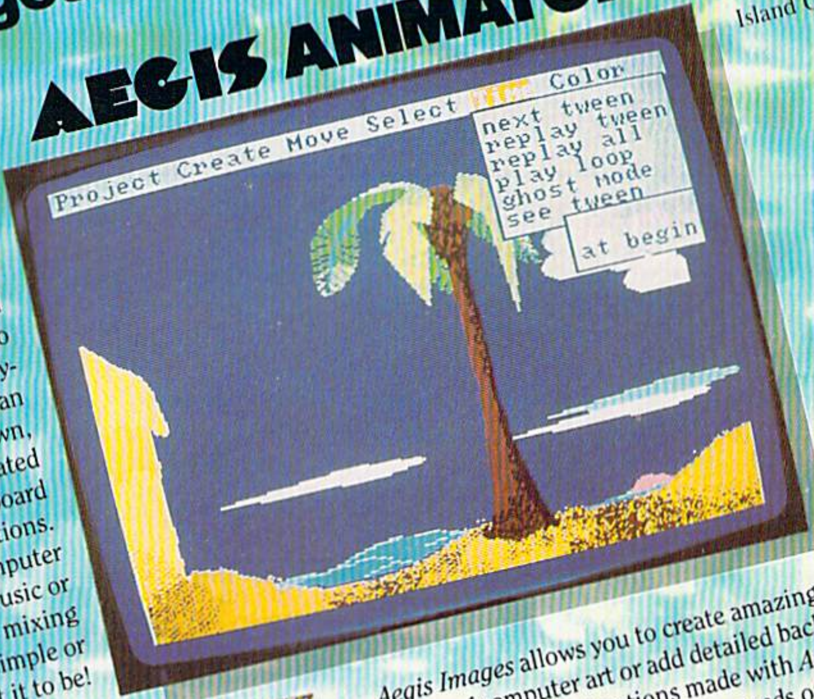

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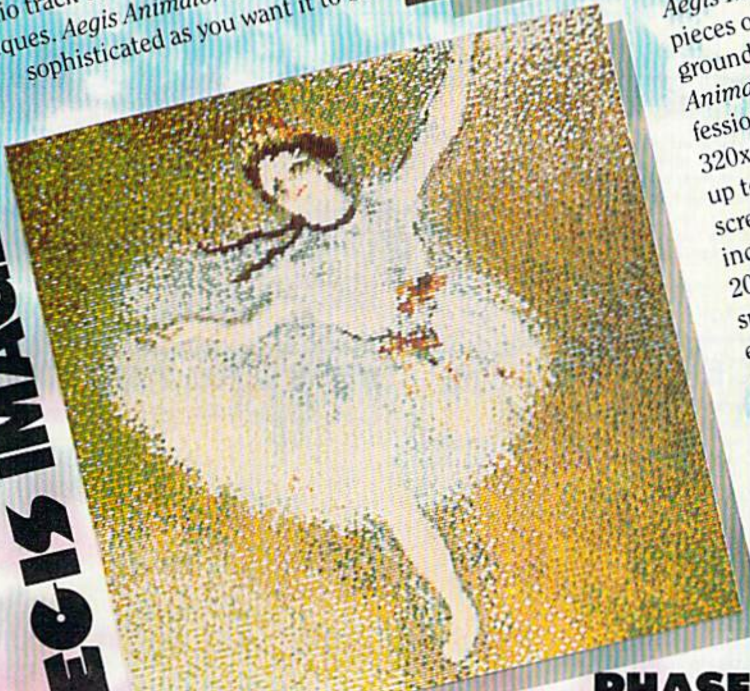

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Side 2 contains several of the same routines for the 128 system but also a T&S editor for going out to track 66, along with a screen dump for the 80 colum mode and lots, lots more.

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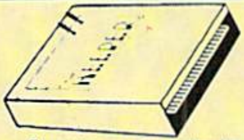

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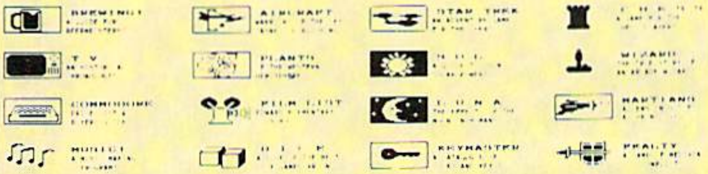

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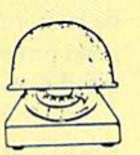

1. **Auto Dial** will automatically dial a set of numbers you choose.
2. **Review Numbers** will review numbers that were answered by a computer.
3. **Save Numbers** will save numbers where a computer answered.
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5. **LOAD Numbers** will load in numbers to continue where it left off.
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Programed by Jim Drew

Are both collections of 20 programs per diskette (that works out to about $1.00 per program!) that help you explore and enhance your Commodore 64 and/or 128 and 1541 disk drive. Now you can unlock many secrets formerly known only to top machine language programmers by using these sophisticated "tools." If you have ever been curious about the inner workings of your computer system, now is your chance to dig in and find answers with the help of these programs. These collections of programs have gotten rave reviews from actual users, and we are sure that you, too, will be pleased.

The programs include on each diskette are listed below

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The Dock (view/repair disk contents)
Sync Checker (diskette)
Imbedded Track Number Creator
Disk Manipulation System
3 Minute Copy (backup program)
Diskette Matcher (compare sectors)
Unscratch A File (recover file)
View BAM (block allocation map)
1541 Read/Write Test
½ Track Reader
Header Reader (display disk header)
Sync Maker
Device Number Change (disk drive)
Electronic Arts Backup
Drive Mon (disk drive m/l monitor)
Diskette File Log (start-end address)
Write-Protect Sensor Test
Repair A Track (recover data)
Fast Format (10 seconds)
½ Track Formatter

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TOP SECRET STUFF II

RAM Test (test Computer RAM)
Copy $A000-$FFFF (under ROMS)
Display G.C.R. (All sector data)
Un-Write Protect (diskette)
Unnew Program
Wedge - $8000
Smooth Scroll (messages up screen)
Koala Dump (koala pad screen dump)
Disk Manipulation System
Disk Eraser (20 second clean wipe)
Split Screen (TWO screen colors)
Disk Protection System (stops copies!
Write Protect (diskette)
Boot Maker (autobook BASIC programs)
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on the side of the computer next to the ON/OFF switch.

34. BOX 1,10,10,50,50,85,1 draws and paints a square which is rotated 85 degrees clockwise. Try that with PEEKs and POKEs.

35. DRAW 1,0,0 TO 319,0 TO 0,199 TO 319,199 quickly draws a "Z" from corner to corner of the graphics display.

36. The CIRCLE command has so many options and possibilities that it will require a full column to cover them all.

37. The PAINT command will not set any speed records, but it is certainly a handy graphics feature to have.

38. There are numerous other graphics commands which should give the programmer complete control over the VIC-II chip and the majority of its capabilities.

39. This list of C-128 delights would not be complete without mentioning the sprite commands. Type SPRDEF and you suddenly find yourself within the SPRITE DEFINITION MODE. Essentially you may now use the flexibility of the screen editor with some special commands to create, modify, and save sprites.

40. Once the sprites are made (SPRDEF is only one of the three ways to do that), SPRITE and MOVSPR provide unprecedented ease of sprite manipulation within a program. One mode of the MOVSPR command lets you specify speed and direction of motion for a sprite. Turn it loose, and the sprite continues on its way without further program supervision!

41. It should be possible to write a very short PONG program using the COLLISION interrupt command. Specify the type of sprite collision and the line number of a BASIC subroutine. Whenever the collision occurs, program execution automatically branches to the subroutine. What more could you want?

42. The sound capabilities of the SID chip are fully accessible with a host of BASIC commands. ENVELOPE N, where N is from 0 to 9, allows you to use 10 predefined musical instrument envelopes ranging from accordion to xylophone.

43. FILTER, SOUND, and PLAY are some of the other audio-related commands. The PLAY statement allows you to put entire musical compositions within a string, including seven octaves of three voices at specified volumes, and either filtered or not.

44. The CP/M disk opens up an entirely different computer within the 128. CP/M is a disk operating system (DOS) which is quite different from the Commodore DOS. In fact CP/M seems very similar to MS-DOS and PC-DOS. Unfortunately it costs another $20 to get the full documentation on CP/M, but there is enough information in the *C-128 System Guide* to begin explorations on your own.

This list could continue, but it has covered the majority of the new, interesting, and exciting features of the Commodore 128. In future months, we will deal with some of the specifics of BASIC 7.0. One of the first topics will be a translation of some of the C-128 commands and structures into their C-64 equivalents.

Although the C-128 is definitely oriented towards the new 1902 color monitor and the 1571 and 1572 disk drives, all the functions of the computer (except color) are available with the 1541 disk drive and a monochrome ("green screen") high-resolution composite monitor, which is my current configuration.

I connect my green screen monitor to pins 1 (ground) and 7 (monochrome) of the nine-pin RGBI connector for 80-column text. I switch it to pins 2 (ground) and 4 (video out) of the eight-pin video connector for 40-column text and graphics. I also connect pins 2 (ground) and 3 (audio out) of the eight-pin video connector to an amplifier and speaker since the monitor does not have audio capabilities. The green screen displays colors as various shades of green.

The 80-column text mode is very sharp on the green screen. It seems almost a waste to use my high-resolution RGB (red-green-blue) monitor, since only 80-column text (not color graphics) is displayable on it. Unless you have a very high quality RGB monitor (meaning one in the! $500 to $800 range), a good quality high-resolution green screen (meaning one in the $80 to $200 range) will provide superior text readability. Unless you are using 80-column software which really utilizes (text mode) color, the green screen approach will save your money and your eyes.

Before buying the C-128, I had thought that I could use my RGB monitor to display the 40-column text and color graphics, as well as 80-column text. Unfortunately, the color graphics signals simply do not go to the RGB connector. The 40-column text/graphics screen and the 80-column text-only screen are completely separate and distinct entities.

For displaying color graphics and for game playing, any color composite monitor (such as the 1702) or television should suffice. To be able to write, run, and edit programs in 80-column mode (definitely a major advantage), consider adding a green screen. Two screens side by side, one for text and the other for graphics, represent an optimal way to utilize the capabilities of the 128.

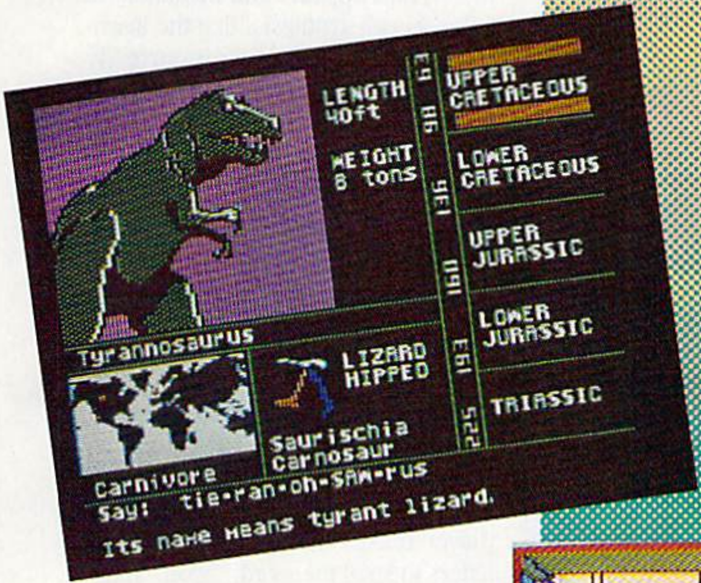
I'll bet there are very few owners of the 1902 monitor who are not already disgusted with the necessity of manually flipping the composite/RGB switch on the monitor. In this age of electronics, why shouldn't the switching be performed by a software-controlled relay at least? A good project for the hardware enthusiasts! Better yet, forget the switching. Consider using two monitors.

All in all, the C-128 is a very impressive machine. BASIC 7.0 is an exciting environment for exploration and program development. It is a quantum leap or two beyond the C-64. But be warned: not long after using this computer, you will have become irrevocably spoiled.

Very soon you will find yourself telling stories about programming the C-64 back in the old days when it took 13 POKEs and 30 lines of code just to produce a beep from the sound generator. Or that you had to type a ridiculous sequence of more than 40 characters simply to display your disk directory on the printer. The others around you will slowly nod in agreement. Why, that was just a month ago, wasn't it? ☐

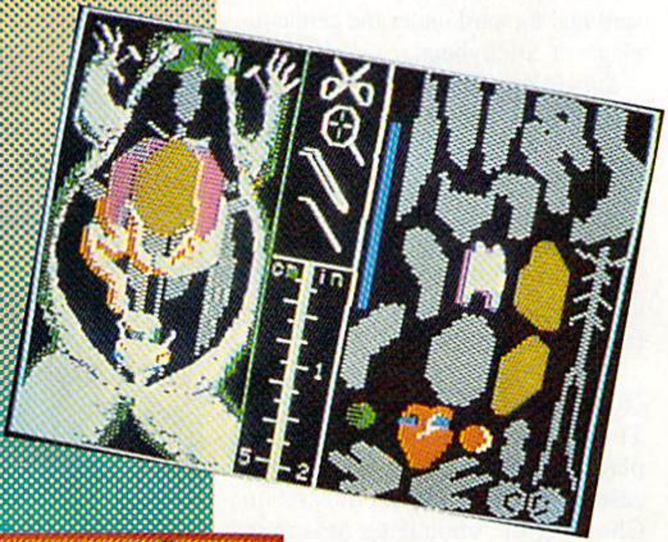
PLAYING IT SMART WITH COMPUTER SOFTWARE

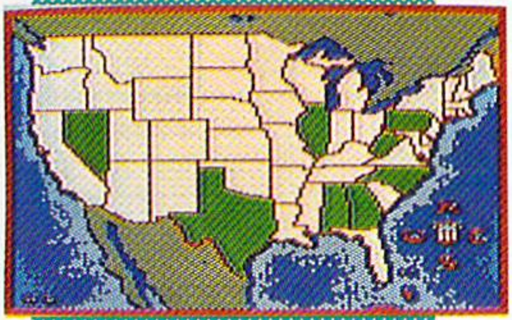
A Parent's Guide to Educational Games



Say: tie-ran-oh-SAW-rus

Its name means tyrant lizard.





Dinosaur Dig *(left)* includes a 32-beast overlay.
READER SERVICE NO. 209

Operation: Frog *(right)*: a bloodless dissection kit.
READER SERVICE NO. 210

Learn geography, history on your U.S. Adventure (bottom).
READER SERVICE NO. 211

By Joyce Worley

Home computers make it easier to learn than ever before. With some help from the excellent software programs now available, kids can master many lessons by the comparatively painless process of playing computer games.

Not that computer games can replace the classroom and teacher. Academic instruction is still the cornerstone of education, and it won't be easily supplanted by even the best software. Interaction with the teacher and other students prepares students for the world in ways no computer can.

The trouble is that, as all teachers know, classroom activities aren't enough; the educational process needs reinforcement through home study. But no humane parent wants to extend the schoolday another two, four, or six hours. After all, when adults finish their day's work, they don't want to go home to an evening of labor. Children are no different; after six or seven hours in class, they, too, need some r & r.

Educational games are perfect for those times when a pupil needs more practice with his lessons, but is weary of classroom studies. The best of these cloak their tutorial message so well that the young computerist will hardly realize that learning is taking place.

Preschool Lessons

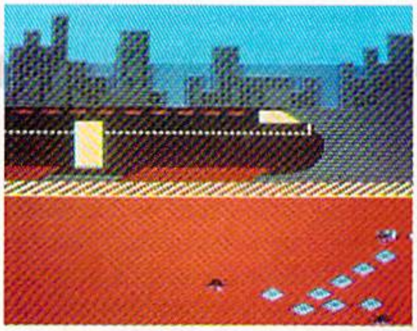
Computer-savvy parents know that kids can start learning from their micros as early as two years old, and there's a lot of software available to start preschoolers on the road to academic accomplishment.

Many kids begin by learning to count, and *Stickybear Numbers* (Weekly Reader Family Software) is a head-start program that makes it easy to master numbers. Designed for ages 3-6, the touch of any number key produces a graphic display of that many objects. Touch the space bar, and an object disappears, reducing the number. There are 20 built-in animations, ranging from drums to snowmen, plus the lovable bruin Stickybear himself. The graphics are bold and beautiful, brightly colored, and cleverly conceived. The "take away one" game will never rank as a high-skill thriller, but tots love it, and they quickly learn to count backward and forward under the gentle tutelage of Stickybear.

Stickybear ABC (Weekly Reader) teaches kids 3-6 the alphabet by presenting two animated pictures for each letter. Touching any key produces a picture; touching the same letter again displays the second scene. The child needs no adult supervision to enjoy this program. The animations provide plenty of incentive.

Charlie Brown's ABC's (Random House) features the Peanuts gang. The child pushes a letter to see it displayed onscreen in upper and lower case accompanied by an illustration. Choosing the same letter again produces a cartoon. For example, "F" yields a drawing of a football. A second touch calls up a cartoon in which Lucy holds the football for Charlie Brown to kick, then jerks it away at the critical moment. This amusing program holds kids' interest for a long time, as they watch the antics of Charlie Brown, Snoopy, Lucy, and their friends.

Preschoolers must learn other, more subtle lessons before they're ready for kindergarten. *Stickybear Shapes* and *Stickybear Opposites* (both from Weekly Reader Family Software) help tots master some difficult concepts. *Shapes* teaches kids to identify five common geometric forms: circle, square, triangle, rectangle, and diamond. The child must locate and name these shapes in full-screen pictures featuring Stickybear and his family.



Agent USA *teaches geography as players hunt for and defuse the FuzzBomb.*
READER SERVICE NO. 215

AEGEAN VOYAGE
SPINNAKER

Teaches people & places of Greek myth.
READER SERVICE NO. 213

Ah, bonjour kermit! Press C= to link up.

Muppets **Welcome Aboard** *students.*
READER SERVICE NO. 214

Stickybear Opposites presents numerous sets of words through pictures that illustrate the paired concepts. For example, the big bear rises high on a teeter-totter to demonstrate "up," then at a touch of the keyboard, the teeter brings him back to the ground to depict "down."

Spelling and Word Skills

Learning word skills dominates the grammer school years, yet many students still don't know how to spell. These programs give kids the necessary practice.

Cave of the Word Wizard (Timeworks) uses spelling in an underground adventure that should keep youngsters smiling through their lessons. After choosing one of the 10 spelling lists, which range in difficulty from beginner (ant, cat, man) to advanced (accumulate, unanimous, pharoah), the student picks either Becky or Mark as the onscreen cave crawler. This hero or heroine must avoid pits, spiders, snakes, and other hazards in a search for magic crystals that open the door to escape the underground labyrinth. Periodically, the Wizard appears and demands, in crisp speech synthesis, that the learner spell a word. Typing it correctly gains extra battery life for the flashlight, but spelling errors drain energy.

Stickybear Spellgrabber (Weekly Reader) is specifically for second, third, and fourth graders, ages 6-9. It's three separate games that teach 4,000 words. There's also a way to enter special word lists, so parents can input the child's spelling lessons from school. "Picture Spell" displays a wall of shelves centered around a picture, and the letters to spell the item depicted are scattered through this maze. Using keyboard or joystick, the player makes Stickybear gather the letters to spell the word. "Word Spell" is a study tool. First the word appears, and when the child feels ready, the program scatters the letters about the maze. To win, the player must gather them up in the correct order. "Bear Dunk" is like Hangman. A set of dashes indicates the number of letters in the word, as Stickybear stands nervously on a shelf high above a tank of water. Guessing correct letters enters them into their proper positions, but errors cause shelves to slide off the screen. If Sticky's perch falls, the bear plops into a tank of water.

Sea Speller (Fisher-Price) is for ages 7-12. The child uses an onscreen dolphin to point to letter combinations that complete words. A submarine sinks into the ocean bearing three unfinished words, and air bubbles lining the ocean floor contain letter combinations. The child uses the joystick-guided dolphin to select a group that completes one or more of the words before the sub's air supply is exhausted. The graphics and game mechanics of this contest are simple and undramatic, and do little to excite the learner. However, the underwater lesson not only helps kids spell

BLACK THUNDER

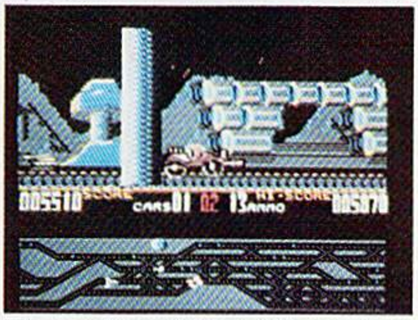
The Avalon Hill Game Company
Commodore 64
Disk; $19.95

Black Thunder is a fast-action strategy contest which asks the question: "Do you dare to travel the roads alone?"

The answer won't be long in coming for those who ride the futuristic freeways of designer Anthony Crowther. One thing's for sure, you won't be lonely with all those guided missiles, warlike helicopters, and kamikaze spacecraft whizzing by overhead.

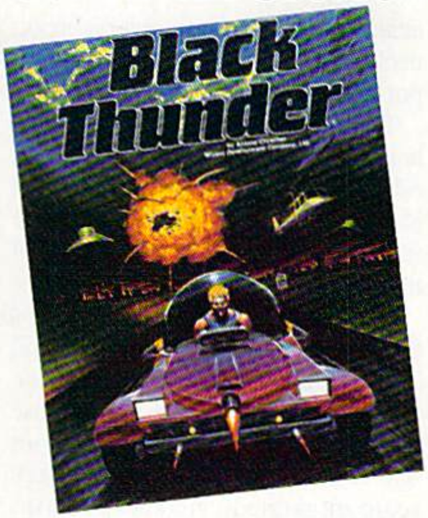
Fortunately, the player isn't exactly driving around in a stripped-down Toyota. The "supercharged, rocket-armed, brand-new CROW-THER" is maneuverable and well-armed.

The main display is sectioned into three parts. A scrolling electronic road map at the bottom of the screen shows the possible routes and warns and player of approaching enemies. A data band with the current point total, high score, ammo supply, and number of cars left runs across the center of the screen. The top portion shows a side view of the player's vehicle as it moves along the track-style streets. This is visually interesting, but it doesn't help much during an actual game. In fact, many players will only have time to glance at the varied backgrounds, which include fuel tanks, greenhouses, mazes, and bunkers.



The graphics of Black Thunder's *32 screens have a unique homemade feel.*

Designer Crowther is obsessively self-promoting. According to the game's title screen, *Black Thunder* was "Directed by A. Crowther...the author of Gryphon...starring Human Crow-ther." The back of the package informs that the car is also named "Crow-ther." The all-too-familiar name also appears carved in gigantic stone letters along the side of the road with unnerving frequency. I've long supported proper credits for computer creations, but this author goes a bit overboard.



Strategy is of only minor importance.
READER SERVICE NO. 216

Black Thunder uses the trappings of the "car wars" craze, but strategy is only a minor element. The player uses the joystick to guide the vehicle over the road map and consults the side-view during combat against airborne foes. The dual visual perspective and the aggressive nature of the

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simple words, it also reinforces classroom lessons since the letter combinations used illustrate common spelling patterns and rules.

Spell It! (Davidson) concentrates on 1,000 commonly misspelled words, divided into five difficulty levels appropriate for students age 10 and over. It also lets the parent input word lists so the student can study homework assignments with the program's four activities. "See It," the first study tool, displays a word onscreen, divides it into syllables, then presents a sentence with a blank to be completed. "Practice It" displays the word just long enough to be recognized but not studied, then challenges the student to spell it correctly. "Unscramble It" presents jumbled words for the learner to decipher, and "Spell It!," the title game, is an arcade style test to distinguish correctly spelled words from incorrect ones. The gamer manipulates a frog until it's under the right word, then the little hopper jumps up and gobbles it down.

Word Attack! (Davidson) is more than just a spelling program; it helps students, 4th through 12th grades, actually use new words. First the learner sees the new word displayed onscreen with its synonym or a definition, and a sentence illustrating its correct use. "The Multiple Choice Quiz" requires the child to match definitions to words. "Sentence Completion" displays the definition of the target word, and the child must type the missing word into a sentence, spelling it correctly. Finally, "Word Attack!" challenges the student to blast the word whose definition appears at the bottom of the screen before time expires. Parents can enter new word lists into the program to continue expanding the student's vocabulary even after the original 675 words are mastered.

Wordfinder (CBS) asks students to make as many new words as possible from any one of its 24 keywords. Most of these embedded subordinate words offer bonus-scoring opportunities, by asking the player to select a definition from four possibilities. When the student can't find any more, the computer offers a look at a list of all possible words. *Wordfinder* is a highly entertaining game for all ages, but along with the fun, it gives a practical lesson in how words are formed.

History Lessons

Time Bound (CBS) is one of the most successful educational games ever written. It actually makes users wish they knew more history in order to play better. The computerist must find Anacron, a lab assistant who's lost in time. He's tumbling between the years 0 and 2,000, and the only way to locate him is by monitoring historical events to pinpoint the year he's visiting.

Blips representing events fly from the center of the screen toward the outer edges. When the joystick-operated scanner snags one, the event is printed along with the year it happened. At the same time, the screen shows the event where Anacron is at attackers give *Black Thunder* a breakneck pace rarely attained by contemporary computer action titles.

The graphics have an interesting, homemade look that adds to the game's offbeat appeal. Use the "pause" key and check out the incredible inventory of futuristic artifacts Crowther has packed into his 32 screens.

A manic musical score keeps things suitably hyper. Avalon Hill even sprang for speech synthesis, though it isn't put to very exciting use in the program. A voice annoucnes "game over" and reads the player's score in garbled computer-English.

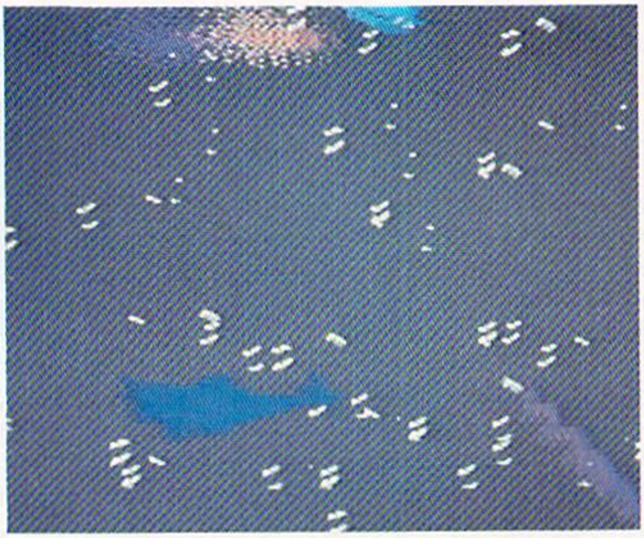
Documentation is the program's greatest weakness. The puny folder tells the purchaser nothing significant about *Black Thunder* beyond how to play with keyboard order entry (not very important to most Commodore 64 owners), and what to do if the program doesn't load. When the user can learn more about a program from the ad copy on the back of the box than from the documentation, something is wrong.

Black Thunder is a game that takes time to appreciate. At first, it may seem sort of trivial, almost old-fashioned. After a few rounds, however, the game's underground comix sensibilities work their subtle magic on the gamer.

What's missing is real depth. The user should be able to modify the car's defenses and weaponry or, at the least, get to choose a vehicle from a bank of possibilities.

With the proper enhancements, *Black Thunder* could have become a "cult" classic. As is, it's a very good action contest, with a unique style that should appeal to joystick commandos and frustrated car-poolers everywhere.

The Avalon Hill Game Co., 4517 Hartford Road, Baltimore, MD 21214 (phone: 301-254-9200). *—Bill Kunkel*



Not the easiest game to learn, **The Dolphin's Rune** *requires the player to share an almost telepathic bond with the creature as he maneuvers it through an abstract underwater jigsaw puzzle.* *READER SERVICE NO. 217*

THE DOLPHIN'S RUNE

Mindscape
Commodore 64
Disk; $29.95

Anyone who doubts that computer games are becoming more sophisti-

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that moment, but not its year. In the course of this search, the student learns dates through time lines tracing the histories of sports, household items, political leaders, water and land transportation, scientific tools, fun and games, architecture, communication, time, air, and space.

Aegean Voyage (Spinnaker) is a seafaring adventure that teaches the characters and places of Greek mythology. The player steers a ship through the troubled waters of the Aegean Sea, from Athens to many of the islands of ancient Greece. At each portal, an oracle gives clues about one of the other isles in those waters. Some islands contain treasures, but some have deadly adversaries, and the player has to keep track of the mysterious clues to determine which are safe to visit. This light-hearted program makes Greek mythology entertaining and the search for the treasures should keep kids coming back to play again and again.

CBS Software has two electronic history books, both for ages eight and over. Each features an Easykey vinyl overlay that puts the program menu on the console keyboard, making it easy to access options and enter answers to questions.

Dinosaur Dig presents information about 32 prehistoric reptiles. Touching a great beast's name on the keyboard overlay produces an electronic page with a color picture, the pronunciation and meaning of that name, its length and weight, the time period it lived in, a map showing where its remains have been found, and its diet. After studying the facts, four quizzes test the knowledge. "Dino Dig" presents one clue at a time until the student guesses the correct dinosaur. "Dino Flash" presents pictures of the beasts for the pupil to identify, flash card style. "Fact or Fable?" offers pairs of dinos and asks if they lived in the same period. "Who's Biggest?" shows pictures and asks the student to guess which dino weighed the most.

The Sea Voyagers uses the same format to present information about 30 New World explorers. Selecting an explorer shows the student a portrait, his full name, nationality, lifespan, the flags of the country for which he sailed, voyage dates, achievements, and a map of the sailing routes. The tests are similar to those in *Dinosaur Dig*. "Who Goes There?" gives clues until the student guesses the correct explorer. "Explorer Mix" presents three facts and three portraits scrambled together, which must be properly sorted. "Explorer Match" displays five explorers and asks the student to group them based on what they have in common.

Geography

U.S. Adventure (First Star) displays a map of the United States as it was when the nation was formed, then introduces new states in the order they entered the Union. The player starts in the first state, Delaware, then gives compass instructions to travel to the cated can take *The Dolphin's Rune* as Exhibit A. *The Dolphin's Rune* casts the player as a sea-dwelling mammal on a poetic dreamquest in search of the meaning of life.

The brainchild of experimental painter, sculptor, and computer artist John O'Neill, it represents an authentic attempt to create a new level of interactive experience. The player not only controls the movement of the onscreen dolphin, but shares an almost telepathic bond with the creature as it moves through an abstract undersea jigsaw puzzle.

This is not an easy game to learn. Thankfully, the excellent documentation provides step-by-step instructions for navigating through the sea, which is divided into color-coded areas called "thermoclines." Guided by the joystick, the dolphin can swim in any direction, including toward, and away from, the screen.

Since the dolphin is a mammal, it must surface once every eight minutes to breathe. Unfortunately, this puts the dolphin in danger of being caught in the tuna nets and slaughtered. John O'Neill has struck a telling blow against reckless fishing practices by showing this unpleasant experience in disturbing detail. Sharks, which patrol the top two thermoclines, are the other main source of trouble.

The swirling currents of the third level are a gateway to special knowledge. By swimming through the furious vortex, the dolphin experiences a series of "visions," which shed light on the "porpoise" of life. A color then flashes onscreen indicating the color of the current the dolphin must seek next.

These visions enhance the creature's perceptions. The player discovers that he can now hear sounds—clicks and whistles—in strange patterns. These noises are clues which help guide the brainy sea creature to the mystical sea beds where the dolphin runes are buried. Once the runes are located, the dolphin must translate the hieroglyphics using the runic dictionary in the rulebook to solve the puzzle.

The challenge is to assemble a poem from the seeming gibberish collected in the sea beds. When the player forms the first line of the poem, the game rewards the feat with a second vision. The process is repeated until the dolphin completes the whole poem.

One of the title's most annoying flaws is the lack of a "save" feature. The player must either keep a side record of his or her progress with the poem or start from scratch each time.

A problem which is less easily remedied is the ho-hum play-mechanic. When the dolphin swims into a current, the sequence is strongly reminiscent of Buck Rogers without gunplay, a test of hand-eye coordination totally out of sync with the rest of the design.

The Dolphin's Rune seems to have difficulty in deciding whether it wants to be an enriching, poetical experience, an exotic puzzle, or a dull videogame. The constant shifts from one concept to another detract from the overall play.

The program's strong points are its metaphysical setting and its gorgeous graphics and sound. Once the player has received a revelation or two, the game explodes with sound and color in a way that actually suggests

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next state, Pennsylvania. Help options guide beginners who may not remember the proper order of admittance. While traveling around the country, the player collects historical events which must be pinpointed in time to score, and plays trivia games to learn interesting facts about the nation, in an excellent history/geography lesson for students of all ages.

America Coast to Coast (CBS) uses an EasyKey vinyl overlay to present facts about the states. Four games test this knowledge. "State Quiz" poses multiple-choice questions about the states. "Mystery State" presents location clues for the child to guess the correct state. "Across the USA" is a traveling exercise; the player must chart a path from one state to another by entering the names of the bordering states that must be traversed to reach the goal. "State Shoot" is an action contest that requires the gamer to line up an arrow with the target state, then shoot it across the nation as far as needed to hit the target.

Agent U.S.A. (Scholastic), acclaimed the best educational game of 1985, teaches American geography, including states, state capitals, and major cities, through a game so engrossing it completely transcends its educational nature. The user plays the role of Agent USA, who must find and stop the FuzzBomb that's taking over the nation. The FuzzBomb is traveling around the country by rail, and Agent USA must ride the train network from city to city to locate the invader. Obviously, to succeed in the search, the student must know the states and their major cities, then must manage time efficiently in order to buy tickets and catch the trains as they roll in and out of the railway stations.

Mathematics

The study of arithmetic seems natural for computers; microprocessors are well suited for manipulating numbers. There's a lot of software available, ranging from the electronic number books for preschoolers to advanced mathematical tutorials for older students.

The game-oriented math programs are serious about teaching, but they cloak the lessons in amusement so students don't grow bored so quickly.

Tink's Subtraction Fair (Mindscape) is an introduction to simple arithmetic for ages four to eight. Younger kids will need parental help since the program does require reading. Using the keyboard or joystick, kids pilot Tink, the onscreen robot, through a day at the Fair, where he can play games in the amusement booths. These are straightforward tests involving easy subtraction problems, and Tink wins coins for each correct answer. The money then goes to buy entrance into other amusement booths. Although this program has multiple skill levels, even the most difficult setting is easy enough for very young kindergarten or grammar school students.

Fish-metic (Commodore) helps kids ages 7-13 practice math skills while the enhancement of perception.

The Dolphin's Rune combines puzzles, poetry, and a genuinely artistic sensibility in a unique and rewarding fashion. The execution isn't perfect, but its maturity and depth make it well worth any computerist's time.

Mindscape, 3444 Dundee Road, Northbrook, IL 60062 (phone: 312-480-7667). *—Bill Kunkel*

RICHARD PETTY'S TALLADEGA

Cosmi
Commodore 64
Disk; $19.95

The motorsports celebrity provides the ultimate computerized rival in the auto racing program which bears his name. There is little new or innovative in *Richard Petty's Talladega,* but author Robert T. Bonifacio has simulated most of the important factors in an easy-to-play format.

This solitaire contest puts the joystick jockey behind the wheel of a sleek machine capable of zooming around the track at over 250 mph. Once the gamer demonstrates enough proficiency to qualify in a one-lap trial, he or she can compete on the novice "Tri-Oval" or brave the more advanced random course with its unpredictable mix of turns and straightaways. A handy feature allows the player to immediately take a second whack at the last random track generated by the computer.

The command scheme is simplicity itself. The action button serves as the gas pedal, and the vehicle slides in the corresponding direction when the player pushes the stick to either side. Pulling back on the joystick applies the brakes, necessary to avoid spinning out on the turns. The armchair driver can engage the turboboost by holding down the action button when the car is barrelling along at 250 mph. It furnishes a burst of super-speed, but it makes the car uncontrollable on the curves.

The graphics are a mixed bag. The scenery is fairly ordinary, but the cars, depicted in modified first-person perspective, are suitably sleek. There's an onscreen explosion when cars collide, but it's more of a symbol than a true attempt to replicate the inferno of a track accident. The sound, like the visuals, is acceptable, but not outstanding.

Unlike some early auto race programs, the vehicles in *Richard Petty's Talladega* are not equipped with bottomless gas tanks and regenerating tires. The gamer must watch the status report located at the top of the display as well as the road to avoid breakdowns. A stop in the pit gives the backup crew a chance to change the tires, add fuel, and check the engine. Timing pit stops to coincide with a yellow flag, which compels the other cars to move at reduced speed, is one of the keys to crossing the finish line ahead of the pack.

Drafting is an important gas-saving tactic. By lining up behind another car, the player's vehicle is pulled along the course without expending as much fuel.

Another important strategy is leaning on cars to make them move over and let you pass. This is a somewhat delicate maneuver, because leaning can cause a crash if pursued too enthusiastically.

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manipulating a goldfish with a number on its side. The joystick controlled creature must swim over, under, or next to the other fish in the river, depending on whether their numbers are smaller, greater, or equal.

At the simplest setting, the numbers are single digits. As the difficulty increases, the student must compare fish marked with fractions, then decimals. At the top settings, the fish bear negative numbers, fractions, and decimals. Multiple agility levels make this a real workout for joystick-wielding mathematicians while they practice their arithmetic.

Number Builder (Commodore) sets the student to work on a construction site collecting number blocks to reach the target total. Manipulating a worker up and down ladders and avoiding obstacles, the student picks up blocks with numbers to be added, subtracted, multiplied, or divided until the tally is correct. At the lowest level, the youngster only uses addition and subtraction, but at higher skill settings, all four operations come into play at the higher levels. The speed of the construction worker also varies from a slow walk to a run, so gamers must do rapid mental calculations.

Math Blaster (Davidson) is a study tool for grammer school students, or even adults who want to brush on up their skills. The program gives practice in addition, subtraction, multiplication, division, fractions, and decimals, through four activities. First all the facts in the lesson are displayed onscreen for the student to see and study. Then a skill building activity turns these facts into standard mathematical problems to complete onscreen. The third exercise restates the problems in different forms. Finally, the title game provides problem-solving practice through a fast-action arcade game. The student tries to shoot a man from a cannon to hit the correct answer to each problem, while also keeping a balloon in the air. *Math Blaster* also lets the parent type new problems into the program, so it's possible to key in homework assignments, or design special routines for students who need extra practice in certain areas.

Donald Duck's Playground (Sierra) is more specialized; it teaches kids ages 7-11 how to make change. By "working" at jobs, Donald Duck earns money to buy playground equipment. He pays for items at the local stores and makes change from an onscreen cash register. This not only helps kids understand the value of money, it also instills recognition of the work ethic, as they labor for the coin to equip a playground for Donald's nephews.

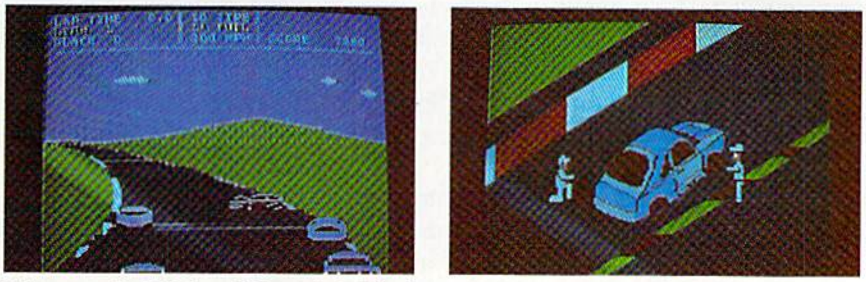
Learning to Type

Everyone needs to type so they can operate a computer efficiently. Fortunately, the C-64 makes a perfect typing instructor.

Mastertype (Scarborough) turns practice into a game, as the student blasts enemies out of the sky by typing the same words and letters that pelt the command ship. After each round, a recap screen shows the score, The price-value relationship always gives reviewers fits. Should a lower cost program rate as well as a more expensive one, even if it's not quite as good? *Richard Petty's Talladega* differs little from a host of other auto racing games, but its relatively low list price might make it a bargain for budget-conscious consumers.

Cosmi, 415 N. Figueroa, Wilmington, CA 90744 (phone: 213-835-9687).

—Steve Davidson



The cars in **Richard Petty's Talladega** *are not equipped with bottomless gas tanks and regenerating tires.* *READER SERVICE NO. 218*

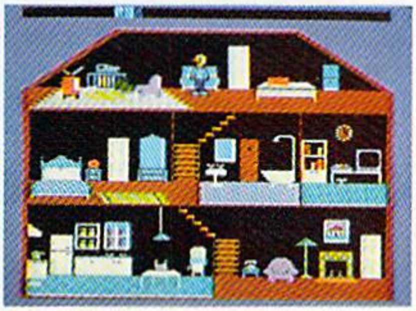
THE LITTLE COMPUTER PEOPLE PROJECT

Activision
Commodore 64
Disk; $29.95

"Did you remember to feed the Hulkster today?" asked Joyce Worley. Caught! A vision of the lovable fellow who inhabits my copy of *The Little Computer People Project* flashed through my brain. I could almost see the inch-high guy shaking his head, now with a sickly green frowning face, and pointing to the bare cupboard.

This wonderfully entertaining program, conceived by Rich Gold and executed under the direction of superstar designer David Crane, is a unique experiment in leisure time software.

This tough-to-classify title most resembles a computerized dollhouse—with an animated tenant who can perform a variety of everyday actions. The principal display shows a cutaway of a three-story house. The bottom floor has a kitchen and living room. A bedroom, bathroom, and computer room occupy the second level. The top floor includes a media room (with a TV set and stereo), a typing station, and a cabinet in which the computer person stores his games.



Little Computer People: *relaxing fun.* *READER SERVICE NO. 219*

The computerist logs the date and time of each play-session on a special screen which appears before the actual program runs. The first time you boot, all you'll see is the house

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average speed in words per minute, number of words typed, and number of mistakes. Finger positioning drills and sentence typing lessons complete the package, which is suitable for all ages (seven and over).

Typing Tutor III (Simon & Schuster) is a series of lessons and tests that go from beginning to top proficiency levels. A special system, Time Response Monitoring, lets the program constantly check the progress and adjust lessons to keep them challenging without being too difficult. The "Letter Invaders" game lets students practice

Stickybear Typing (Weekly Reader) can be used by all ages, but it's best for grammer school students. "Stickybear Keypress" asks the student to type the letters that are highlighted on an onscreen keyboard.

"Stickybear Thump" is an action game. A robot tosses blocks at the bear's head, but each time the typist finishes a sentence, Sticky can throw a ball at the robot. "Stickybear Stories" provides short stories, riddles, and jokes, and varied facts and figures about practice typing sessions.

Astronomy

Sky Travel (Commodore) is a magnificent astronomy program that gives computerists their own home planetarium. The user can find and track sky objects, see solar and lunar eclipses, set the program's clock to view the star movements over time, alter the viewing angle to see other galaxies, even plot and print planetary charts. Using *Sky Travel*'s special map feature, the viewer can see the sky as it appears from anywhere on earth on any date from 10,000 years in the past to 10,000 years in the future. A special information function gives data about the planets, the sun, our moon, and over 1,200 stars. This is not a game; instead, it's an astronomy activity for star-gazers of all ages, from 12 through adult.

The Halley Project (Mindscape) teaches facts about our solar system. The armchair astronaut pilots a space ship from Halley's Comet to other bodies in the Solar System, landing on planets or moons as directed. Clues that require the space pilot to learn more about the heavenly bodies lead to the proper destination. The student learns to identify the constellations in the real sky, because they are landmarks by which the ship must be steered.

Unlimited Learning

There are educational games available to teach some fairly esoteric subjects. Here are a few of the more unusual ones.

Operation Frog (Scholastic) is a bloodless dissection kit. Using surgical tools and an examination table, budding biologists remove and study the hopper's internal organs, while the screen displays detailed explanations of each body part and its function. Once the parts are all replaced, the frog hops off the screen to end the lesson. It's got enough of the real ingredients of a laboratory dissection to make the experience valuable for students preparing for later lab work.

Batalla de Palabras (Gessler) is the

standing empty. After awhile, a character opens the front door and tours and place. If he's satisfied, he leaves only to return later with his baggage and a chubby pet dog. The character's appearance varies slightly from copy to copy, which heightens the feeling of personal involvement.

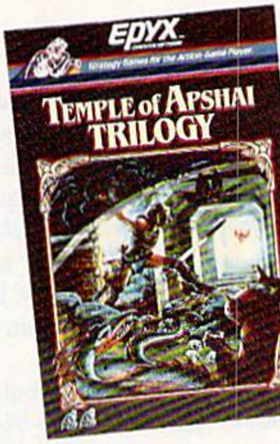
Once the character, whom the documentation encourages the user to name, settles into his new home, he starts doing things. The Hulkster, who resides in this reviewer's machine, has a fine repertoire on his piano, likes to dance to his stereo, spends a portion of each day working at his micro, and is eager to play any of three simple contests: card war, anagrams, and poker.

The most engaging aspect is that the character "learns" these actions one at a time over a period of weeks, even months. For example, about two weeks after moving into the video house, the Hulkster went on a fitness kick and began doing daily exercises. Or, another time, the Hulkster indicated that he needed new realms to conquer on the piano. A little later, he went out and returned with new sheet music. Since then, he's premiered several classical pieces and even a few up-tempo numbers with a distinctly more modern beat.

Watching one's own video pal learn to do elementary things like cook dinner or brush his teeth is as gratifying as seeing a dog do a new trick. Ever wonder how some new parents get into talking about their infant's bowel movements? Spend a few sessions with this program, and you'll find yourself exulting over each minuscule triumph.

Communication with the little computer person is limited, but possible. The computerist can type short messages and use special function keys to deliver groceries, food for the dog, records, and books to the front door of the house. Failure to stock the larder or fill the water dispenser in the kitchen causes the character to take to his bed with an illness.

One sure way to keep your electronic buddy smiling is to use "Control-P" to pet him. When the character sits in his living room easy chair, pushing this pair of keys causes a hand to reach out from beneath the staircase and gently rub his head. A few repetitions are guaranteed to put the sunshine back into his expression.



All three parts, slightly revamped.
READER SERVICE NO. 224

The cartoon-style graphics in *The Little Computer People Project* are attractive and charming. The house is colorful and contains enough "props," like the working stove in the kitchen, to keep the onscreen character busy most of the time.

While the dog looks good standing still, its movement is stiff, and it sel-

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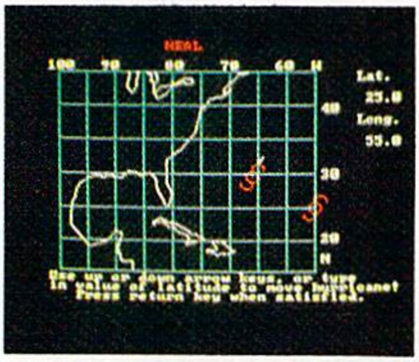
Spanish version of *Word Attack* (Davidson). Like its English counterpart described earlier, the Spanish tutorial teaches vocabulary with four activities.

Forecast! (CBS) is a computerized weather station which enables students to chart weather patterns, track storm fronts, and study how atmospheric conditions produce weather.

There are five activities. "Weather Forecaster" helps the user predict tomorrow's weather. "Weather Calculator" explains the types of measurements used in forecasting. "The Weather Keeper" is a daily log of weather conditions. "The Weather Traveller" reveals the weather for almost anywhere in the country, and "The Weather Tracker" follows hurricanes and tropical storms.



Use up or down arrow keys, or type in value of latitude to move hurricane! Press return key when satisfied.

Forecast! *the weather onscreen.*
READER SERVICE NO. 225

Children just starting on the computer can benefit from a cruise on *Welcome Aboard* (Broderbund). A crew of Muppets help youngsters gain computer literacy through a clutch of activities. Captain Kermit programs the ship's course; Miss Piggy gets a new dress thanks to computer-aided design; Scooter uses word processing and electronic mail to run the ship's message center; Fozzie Bear has databased all his jokes; and Sam the Eagle manages the entertainment room where the child can play computer games. It's an easy introduction to computing that the whole family will enjoy.

The Most Important Lesson of All

The most important thing children learn in grammar school is how to read. Yet despite the emphasis placed on reading, many reach junior and senior high school without ever becoming proficient at this skill. Fortunately, learning to read is largely a matter of practice and repetition, so the computer can be very helpful. The alphabet and word skill programs discussed earlier in this article provide a good start. For older students, there are reading readiness games.

Stickybear Reading (Weekly Reader) is a vocabulary builder with three activities for kids ages 5-8. "Match the Words" requires the child to relate pic- plot twist, and write special endings (or use those provided by the computer). When the story is finished, the author edits it onscreen and prints it out on the special book-sized paper that's included with the program. Then the book can be bound using the hardcover book jacket provided, and illustrated with stickers. Since each of the stories can be written in many ways, thanks to the many plot twists, the child can print out as many subsequent versions as desired on dom does anything more interesting than eat from its dish or take a nap. And the dog and its master look bad when they pass each other on the stairs.

The music is excellent. A team of experts has programmed a tasty selection of songs for the character to play on the piano and listen to on the stereo. The computer person's speech is just a series of unintelligible squawks, however. Even a few voice-synthesized words would have been a most welcome addition.

Like many other highly experimental programs, *The Little Computer People Project* is based on a concept which seems too grandiose for the hardware's capabilities. It comes off well on the Commodore 64, but one can only drool at the prospect of a 128K or 512K version.

The Little Computer People Project isn't as exciting as a shoot-em-up or as challenging as an adventure game, but it provides a special brand of pleasure. It's relaxing fun for the computerist in a more contemplative mood.

Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94043 (phone: 415-960-0410). *–Arnie Katz*

TEMPLE OF APSHAI TRILOGY

Epyx
Commodore 64
Disk; $39.95

What a marvelous idea!

The three "Apshai" programs, *Temple of Apshai, Upper Reaches of Apshai,* and*Curse of Ra,* are still among the most popular action-adventures. Now, Epyx has spiffed them up and released all three on a single disk–and at a bargain price.

The Apshai adventures use the standard role-playing techniques for creating and arming characters. Strength, dexterity, constitution, intelligence, intuition, and ego are the six attributes which combine to give each hero or heroine a unique set of abilities.

The adventurer starts out with 120 pieces of silver with which to purchase weaponry, shields, armor, and healing potions from the Innkeeper. It's even possible to haggle over prices, but don't push your luck too far, or the friendly retailer will toss you into the street.

Once a character is created, or an old one called up from the disk, the player can enter any of the three "Apshai" scenarios. The adventurer then explores a series of labyrinthine corridors where monsters lurk and treasure beckons.

The interface is a great strength. Each command is assigned to a specific key on the computer keyboard, so that a player can pick up treasure, search for traps, or fire an arrow at a charging Dust Wraith with a simple keystroke. Single keystrokes also direct most forms of movement. Entering a number from one to nine facilitates rapid forward progress.

Combat is displayed on the screen, a more involving approach than is found in many other adventures. The onscreen character fires arrows, parries swordthrusts, and vanquishes monsters right before our eyes. A commentary on the fight appears in the data window on the right side of the screen.

Even those who already own one or two of the games in this trilogy may find this package worth purchasing. Af-

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plain paper. Refills are available to make more hardcover books and are available from Woodbury.
tures to names of objects. "Find the Words" is a sentence completion exercise. "Build a Sentence" lets kids choose a noun, a verb, or an object. The Stickybear family acts out the sentence in clever animated cartoons.

In *Kermit's Electronic Storymaker* (Simon & Schuster) the child picks the subject, action, and place and sees the familiar Muppet stars act it out.

Students can practice reading while playing one of the adventure games especially designed for grammar schoolers. Even though the stories are geared for youngsters, the riveting gameplay makes practice painless.

Woodbury Software makes programs that let children ages seven and up write, edit, illustrate, print, and bind their own hardcover books. The PlayWriter Series includes *Mystery!* (a detective yarn), *Castles & Creatures* (a fantasy adventure), *Adventures in Space* (science fiction), and *Tales Of me* (an imaginative tale for younger computerists). Each asks the child to create the heroes and villains, name the characters, decide every

Treasure Island and *Alice in Wonderland* (Windham Classics) are adventure games based on famous books, designed especially for young computerists. In the first, the gamer becomes Jim Hawkins while the other title features Alice on her tour of Wonderland. Both games provide reading practice for students, but education is secondary to the fun.

Young detectives can practice reading while they solve crimes in *Snooper Troops Case #1* and *Snooper Troops Case #2* (Spinnaker). In the first mystery, someone is trying to convince everyone that the house is haunted, and the detective must question suspects and investigate the locale to learn what's really happening. The second case is a search for a missing dolphin who's been purloined from its pool. Both adventures require the student to take notes and make maps in order to solve the crimes.

The Cave of Time (Bantam) is based on Bantam's "Choose Your Own Adventure" book of the same name. The computerist gathers artifacts and returns them to their own time eras. Locations include a prehistoric valley, a medieval castle, Lincoln's Gettysburg-bound train, and the Loch Ness Monster's swamp. But there's a glitch in time that keeps throwing the player backward and forward in history. To escape, the gamer must locate certain tools that can stop the time warp.

Parents must realize that educational games aren't as much fun as conventional ones. The action isn't as fast, the strategy isn't as subtle, and the entertainment is usually secondary to the message. Yet the best of these can make home study easier, since they leaven the teaching with at least a little pleasure. In this way, they keep the students working longer at their studies, which pays dividends in higher test scores in the classroom.

ter all, having all three programs in one place makes it a snap to move characters from one level of Apshai to another, and it makes saving games and characters ridiculously easy.

The documentation is excellent. The instruction book contains a complete listing of the monsters and traps from each scenario, as well as room-by-room descriptions.

The original programs have been revamped slightly so that all share common graphics and a single character set. This gives and package a unified look and feel.

The Temple of Apshai Trilogy is an excellent addition to any Commodore 64 adventure game collection.

Epyx, 1043 Kiel Court, Sunnyvale, CA 94089 (phone: 408-745-0700).
—Bill Kunkel

THE WIZARD OF OZ

Windham Classics
Commodore 64
Disk; $26.95

The yellow brick road to Oz intersects with computing to create a whimsical illustrated adventure geared to the talents of new gamers. The resulting drama, with characters and settings from the first two books by Frank Baum, lets players visit that magical kingdom. There the adventurer meets many of the funny folk from *Wizard of Oz* and *The Land of Oz*, and must solve problems and puzzles in order to return to Kansas.

The adventure begins with several screens of text about life in that windblown state. As Aunt Em bustles through the kitchen, Toto barks a warning of the coming storm. Uncle Henry herds the cattle to safety, and the family dashes into the cellar. But before Dorothy and her dog reach shelter, the cyclone spins them and the whole dwelling into Baum's fantasy land.

The gamer awakens, with Toto, inside the house, then finds a lush wonderland outside. As Dorothy, the adventurer must put together a party of traveling companions to explore the kingdom. This band of roving curios first seeks the Emerald City, where they talk to the Wizard about their wants and needs. But the Wizard won't just dole out the magic they desire; they have to earn his help by finding and defeating the Wicked Witch.

The adventure may present a few surprises for Oz-lings who've never read the books. The familiar Tinman, Scarecrow, and Cowardly Lion are joined by other Oz-critters. Sawhorse provides a sturdy mount at critical junctures. Jack Pumpkinhead is a jaunty jack-o'lantern man. Tip, a little boy, escapes from the evil Mombi with help from the others. There are over two dozen other citizens of Oz with whom the adventurer can interact. Each possesses items of worth or helpful information or serve as obstacles for Dorothy and friends to overcome.

The adventure is sparked by brightly colored and imaginative renderings of Oz and its people, and the musical accompaniment is also outstanding. Instead of the famous songs from the movie or the Broadway play, however, the adventure employs well-known classical themes. These are artfully matched to the action. The performances are good, though Debussy, Wagner, SaintSaens, Mussorgsky, and Tchaikovsky might be surprised at how their works integrate into the story. Fans of the movie may miss "Somewhere Over the Rainbow," but gamers are the winners when a game incorporates such outstanding classical music.

The Wizard of Oz is primarily a conversational game. Every situation that arises can be solved by talking with the characters. When Dorothy asks her companions what they think about each new plot twist, they respond with their own special advice that may provide the solutions Dorothy seeks.

If talking with the party members fails, the computer provides a word list which shows the commands available in each location. This makes *The Wizard of Oz* an extremely easy game. Billed as suitable for children from age 10 up, it also provides a good introduction to adventuring for any novice gamer. Because of the constant flow of suggestions from the Oz-ites, there's little danger of getting into a jam that defies the player's skill.

The game's chief flaw, if in fact it is a flaw, is this simplicity. Advanced adventurers won't find enough here to challenge their abilities, since the puzzles and problems are so easily handled. The game also is extremely linear. Dorothy can't alter the order of her explorations by very much; the adventure must be completed in lock step order. Admittedly, this parallels the books, but senior adventurers will be frustrated if they try to escape this severe channeling of their energies.

This is easy to understand. The game is based on the Baum books, not the movie, play, puppet show, or any of the other adaptations done to date. Instead, it presents new visions of the familiar friends. Although the characters are interpreted differently than in other media, they are faithful to Baum's creations.

The Wizard of Oz is a delightful exploration of a charming land designed especially for kids. It may not be over the rainbow, but it's definitely not Kansas.

Windham Classics, Spinnaker Software, One Kendall Square, Cambridge, MA 02139 (phone: 617-494-1200). *—Joyce Worley*

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EASY LISTER

For the C-64

By J. Roy Pineau

Commodore BASIC provides the user with a series of mixed blessings. While versatile in many aspects with its superb control of keyboard graphics, it presents to all but the seasoned user a disconcerting display of symbols within listings. Whenever a special character represents a change of color, the use of a function key, or a cursor control key, listings display a funny little character to represent it. This makes BASIC listings often difficult to interpret. Having owned a Commodore printer previously I found myself having to look up these codes in a reference manual until I was somewhat familiar with them. To this day, many of the seldom-used symbols still require looking up.

Later, I purchased a non-Commodore printer. To use it I had to buy an interface to adapt the printer of my system. I found that virtually all of today's commercially available interfaces contained routines in ROM which, depending upon the secondary address used to open a file to the printer for listing, I could make listings which replaced the funny little characters with somewhat more understandable mnemonics enclosed within brackets. Neat idea!

Now, however, the only way I can achieve a more readable listing is to print it out. Listing to the screen still provides me with the encoded characters. At a users group meeting, a friend of mine asked me if there was a way mnemonics could be produced on screen listings; and also, since he had a Commodore printer, if he could produce listings like mine. After some research of the *Programmer's Reference Guide* and *The Anatomy of a Commodore 64* by Abacus Software, I found an easy way to accomplish just such a task.

I found that location $A6F3 in the BASIC ROM is the jump to the character output routine used when printing listings. I simply wrote a small boot routine to copy BASIC from ROM to RAM and modified it to "interrupt" the flow of listings. It's sort of a "stop along the way" for a few milliseconds. Then I wrote a very simplified machine language routine (for speed) similar to a group of IF statements. Each time a character is sent out to a listing, either to the screen or printer, it is checked to see if it is one of the funny little characters that mean considerably more to the BASIC interpreter than they do to me. If none are encountered, program control continues as if nothing had happened. However, if one of the offenders is found, the corresponding mnemonic is printed instead.

Easy Lister is loaded as any BASIC program. Its function is to drop BASIC from ROM to RAM, load the machine language routine into upper memory safely tucked away from locations $C000 to $C4CB, and change the pointer in location $01 to tell the computer to execute the modified BASIC.

After everything is loaded (about 45 seconds total) every listing you make to the screen or the printer will show control characters in mnemonic form.

As with any silver lining, it has a cloud in front of it. When you list to the screen, you *must not use* the screen editor to run the cursor up and change a line with a control character in it. If you do, your new line will have mnemonics in it rather than the required control characters. The reason for this is that control characters are located within quotes, and the BASIC interpreter takes anything on the screen within those quotes as literal. The problem is not severe, however, since you have two options for editing your program. First, you can retype the line at the bottom of the screen, and second, you can simply type POKE 1,55 which disables the lister by switching BASIC back to the original in ROM. This makes the lister invisible to BASIC. You *can* screen-edit lines that have no mnemonics in them, but I wouldn't risk it. You can reactivate the lister at any time by typing POKE 1,54 to tell the computer to execute BASIC from RAM.

If you are both energetic and adept at machine language, you might consider disassembling the machine language program and modifying the mnemonics to suit your own taste. You might even modify it several steps further to allow you to edit lines with mnemonics in them. ☐

SEE PROGRAM LISTING ON PAGE 102

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VERY-ABLE

A Variable Lister for the C-64

By Buck Childress

Look, on the monitor! It's a game...it's a utility...no! It's an unguided mess! It came to your program with power and ability far beyond that of normal bugs. The unguided mess. It makes programs run upside down, inside out—every way but the right way. Your would-be masterpiece is doing cartwheels across the screen!

Sound familiar? Lots of things can cause a program to sail into oblivion. One of the most common, though, has got to be forgetting what variables you've used. You know how it goes. You're in the process of programming the game to end all games. You've been keeping track of all the variables by writing them down on paper. But, heck, you're on a roll. The ideas are flowing like Niagara Falls and you just can't take the time to write 'em down anymore. Besides, you've got a mind like a steel trap. You'll remember them.

Time passes and, by golly, you need to add a new variable. Let's see now. Isn't that strange? You can't quite remember them all. No matter, you'll use something totally obscure that surely couldn't be in the program. Maybe Z9$. Yeah, that's it. Who ever uses that one?

Now comes the moment of truth. You type RUN, press RETURN, and there it goes...and goes...and goes...holy Toledo, what was that? How come the computer is dead? It sure wasn't what you expected. So, after spending hours going through line after line, there it is! Incredible, you *did* use Z9$ before! And that new value you assigned it threw everything into a tizzy. (This happened to me one time, and, yes, it was with Z9$! A hard lesson well-learned.)

If you occasionally (or frequently) have variable troubles, you'll love *Very-Able.* It lists the number of each line that contains variables, and all the variables on that line. If two or more are on a line, they will be separated by spaces. If you see an asterisk (*) after a variable, it's an array type.

After typing in and saving *Very-Able,* run it. Then load the program you want to examine. Type SYS 49152, press RETURN, and *Very-Able* will begin listing the applicable line numbers and variables. Twelve lines are listed at one time. Press the COMMODORE key and the next twelve will appear. Pressing the CONTROL key displays the previous twelve. As a matter of fact, you can press the CONTROL key and go all the way back to the beginning if you like. So it's possible to go forward and backward as far and as much as you need. If, while going forward, a line of dashes appears, *Very-Able* is letting you know there are no more variables in the program. To rapidly list forward, hold down the COMMODORE key. To rapidly list backward, hold down the CONTROL key.

Because *Very-Able* is a machine language program that resides in an area of memory separate from BASIC, you can load and save programs without disturbing it.

I hope *Very-Able* helps you turn that unguided mess into the masterpiece you intended. ☐

SEE PROGRAM LISTING ON PAGE 101

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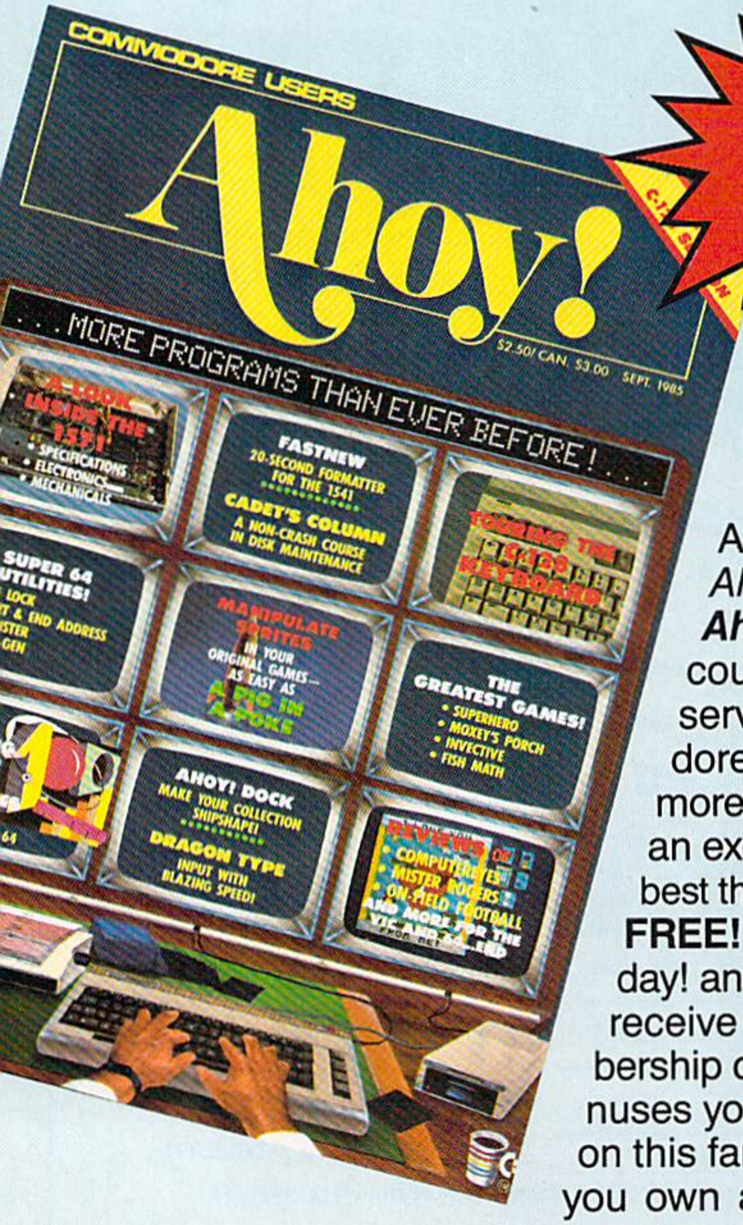
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THE COMMODORE MAGAZINE THAT OFFERS YOU MORE

BRICKBUSTERS

For the C-64

By Paul Seeburger

You are being held prisoner in the dreaded mile-deep dungeons of the evil Toragard, dictator of Myoria. Once every five years, evil King Toragard selects a prisoner to play a game he calls *Brickbusters.* If that prisoner wins the game, he is freed. If he loses, he is put to death. To your great surprise and delight, you are chosen to play the game this year. You are taken from your dungeon cell to a small circular room. Inside sits King Toragard. After greeting you with an evil smile and wishing you luck, he proceeds to give you instructions.

Your objective is to knock out every brick in the room above you, using a limited supply of Dynaballs and a remote-controlled Dynaboard that you can move left and right. Toragard leaves the room and suddenly you are all by yourself, ready to play *Brickbusters.* A Dynaball flies up toward the bricks far above. It hits one and is suddenly propelled straight back in your face. You push left on your controller and deflect the speeding ball back at the bricks. Minutes later, you are still going strong. Only one more brick and...wow! What's happening? The room above you is filled with bricks again, only there are more than before. You abruptly realize that no one has ever won King Toragard's *Brickbusters,* and you now know why. You clear screen after screen and still it goes on. Will it ever end?

When a Dynaball hits a brick, the brick is ionized instantly. After hitting a brick, the Dynaball will be propelled at a random angle away from the brick it hit. The Dynaball will not affect the walls or ceiling when it hits them. Instead, it will bounce off with an opposite angle to the one it had upon collision, unless you are moving the Dynaboard in the direction the board was moving when it hit the board, but at a shallower angle. This is called putting "English" on the ball. There is only one time when it is absolutely necessary to use English: when the ball is bouncing straight up and down between the ceiling and the Dynaboard.

The room above you is unaffected by gravity, and no friction will be put on the ball when it hits the walls, the ceiling, a brick, or your Dynaboard. The ball will never lose enough speed to stop because it picks up energy from everything it hits.

After clearing the first room or level, you will be put on a new level. After clearing all four screens, you will be sent to the first again. Every screen is slightly faster, and you will receive one extra Dynaball for every screen you clear.

Sometimes, bricks will be ionized by just being next to bricks which are being ionized by a Dynaball. At other times, the Dynaball might not hit a brick directly enough and won't cause the brick to be ionized.

When *Brickbusters* is first run, the title screen will appear. The program will then ask the following:

```
BALL SPEED (0-4)?
BOARD SPEED (0-9)?
BOARD SIZE (L,S)?
NO. OF PLAYERS (1-4)?
JOYSTICK OR KEYS?
```

A ball speed of zero is very slow and four is extremely fast. The board speed should correspond to the ball speed you are using. I recommend a board speed of at least four at all times. With a ball speed of three or four, you should use a board speed of five to nine. This makes it much easier to get to the ball.

There are two board sizes: small and large. Large is much easier. Using the small board is like playing tennis with a ping-pong paddle, especially at high speeds.

One to four players may place at once. The game rotates between players when the current player has lost all his/her balls or cleared a level. All players must use the same speeds and controller.

You may use either a joystick (in Port 2) or the keyboard to play. For keyboard users, the ";" key moves the board left and the ":" key moves the board right.

There are defaults to each of the above questions that you may use by simply pressing RETURN on any question. The defaults are ball speed two, board speed four, large board size, one player, and joystick control.

After you answer the above questions, the screen will clear and the current player number will be displayed. Next, the playing screen will appear. At the top, the current player's score, number of balls left, high score, level, current player number, and number of bricks left will be displayed.

The score, high score, and number of bricks left are updated every time a brick is ionized. One point is awarded for each ionized brick. The high score is self-explanatory, and the #LEFT, as it is labeled on the screen, displays the number of bricks left on the screen.

The balls left are updated only when you lose a ball or start a game. The number not yet in play are displayed, so that when you have three balls total and are using one, two balls left will be displayed.

Finally, the level and player numbers are only updated when players change. The level is the screen you are on in relation to the one you started on. This means that no matter what ball or board speeds you selected, you will always start on level one. The player number is the same as is playing at that particular time.

In *Brickbusters,* several keys have special purposes. SHIFT key has been programmed to halt the program's execution when it is depressed. This allows you to leave your game to answer the telephone by pressing down SHIFT LOCK. When you come back, you may resume by releasing SHIFT LOCK. Also, pressing RETURN will always restart the program, except when the screen is announcing a new player. Press the fire button or SPACE to release the ball at the start of each game and after losing a ball. To continue or restart the game when GAME OVER is displayed, you must also press the fire button or the space bar.

Here are several tips to help you do well at *Brickbusters:*

1. Follow the ball across the screen with your board, and try to keep the board under the ball.

2. Try to get the ball into the upper layers of bricks to cause it to destroy the bricks faster. It will sometimes bounce around from brick to brick ionizing many bricks before you have to deflect it again with the board.

3. When there are only a few bricks on the screen, and the ball isn't hitting them frequently, continue putting English on the ball. This is because the ball will gain speed and have a much shallower angle of flight. If you let the ball bounce normally off the board enough times, it will eventually hit the remaining bricks with much less risk of losing it.

To execute *Brickbusters*, type the following commands in direct mode and press RETURN after each line:

```
LOAD "BRICKBUSTERS",8,1
SYS 49152
```

SEE PROGRAM LISTING ON PAGE 104

— COMMODORE —

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REVIEWS

X-10 POWERHOUSE

X-10 (USA) Inc.
Commodore 64
Interface: $125
Software and cable: $25

As Commodore computer users we are considered to be at the forefront of high technology in the home today. As such, many of us do not limit our high tech acquisitions to home computers. This is just what X-10 (USA) Inc., the distributor of the BSR X-10 power line carrier remote control system, is banking on with their new X-10 Powerhouse Computer Interface. With over 1,000,000 X-10 systems currently installed in American households, a large number of these are expected to have Commodore computers. If your household is among these, the Powerhouse may be just what you have been waiting for.

The X-10 interface is compatible with any Commodore computer–the 64, the 128, or the VIC 20. However, the software is designed to work with the 64. To use the interface with a VIC or with a 128 in 128 mode, you must write your own code.

An Overview

The X-10 system is a mature product which has been around for several years. I have been using the system in my own house for over six years. During this interval the system has been found to be safe, effective, reliable, low in cost, and easy to install and maintain. In short, the X-10 system is well-designed and thought out with the end user in mind.

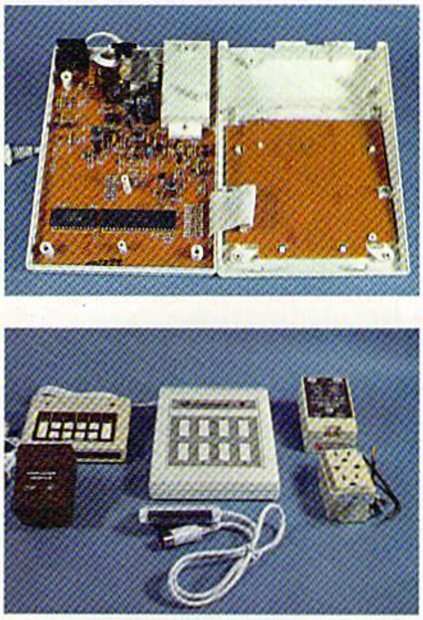
The X-10 system is a power line carrier remote control system for home lighting and appliances. It lets you turn on or off any light and appliance anywhere in your home from anywhere else in your home without the need to install expensive remote control wiring. This bit of legerdemain is carried out by using the existing house wiring to carry specially encoded high frequency signals between the various components of the system.

The X-10 components can be placed in two categories: remote modules and controllers. The former include a variety of plug-in or easily installed units which control an electrically powered light or appliance by replacing the function of the device's on/off switch. The latter are the transmitters which generate the controlling signals.

The basic modules are the lamp, appliance, and wall switch units. These $20 units are the staples of the home system. The first two modules just plug into a standard wall receptacle. The controlled appliance is then plugged directly into the module. The wall switch module is wired to replace an existing standard wall switch. The lamp and wall switch modules have the ability to dim your lights as well as turn them on and off. Note that these two modules are designed for incandescent lights only. They cannot be used with fluorescent lights or other appliances. The lamp and wall switch modules are rated at 300 and 500 watts respectively.

The appliance module may be used to control virtually any electrical device. However, it lacks the light dimming feature. Just make sure the controlled appliance is within the module's ratings. These are up to 15 amperes for resistive loads such as heaters, toasters, and coffee pots, ⅓ horsepower for motors, 400 watts for TV sets, and 500 watts for incandescent lamps. The variation in these ratings is due to the specific electrical characteristics of each class of appliance.

If you need a bit more capacity the Wall Receptable Module, at $25, is rated an unconditional 15 amperes for all types of loads. This is enough to handle most window air conditioners. This unit is wired in to replace an existing wall receptacle. There are also a pair of plug-in, heavy duty, 220- volt modules rated at 15 and 20 amperes.



Top: inside view of Powerhouse, showing microprocessor and RAM. Bottom: Powerhouse (center) and some X-10 components.
READER SERVICE NO. 212

At the other end of the chain are the controllers. These come in two basic varieties: a Command Center and a Mini Controller. These are both manually operated units. The Command console has individual push buttons for sixteen remote units. The Mini Controller handles two banks of four remotes for a total of eight units. Both units can send bright and dim commands to lamp and wall switch modules. There are also a pair of panic buttons which turn all lights on (lamp and wall switch modules) and all units off with a single keystroke.

The X-10 system also includes a number of additional gadgets which take the system beyond the realm of simple remote control. A Timer Console ($60) can store up to two on/off operations (without dimming) for up to eight remote units for automatic daily operation. A Telephone Responder and remote transmitter ($75 for the set) lets you call up your house and tell it what to do. There is even a Burglar Alarm Interface/Controller ($50) which will turn on your lights

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or flash them at a controlled rate. This unit will interface with most existing burglar alarm boxes as it accepts either a dry contact or a low voltage input trigger.

The X-10 system is also available from other sources. Radio Shack sells it as their Plug 'n Power Appliance Module. Levitton Manufacturing Company, Little Neck, NY 11362 (718-631-6555) also provides a variety of X-10-compatible modules and controllers. These include a 15 ampere wall switch module which may be used with fluorescent lights and other appliances.

About House Codes and Unit Codes

The X-10 system distinguishes among its various remotes on two levels. Each remote unit is uniquely identified by one of 16 house codes, designated by the letters A-P, in conjunction with one of 16 unit codes, designated by the numbers 1-16. These are set by positioning a pair of miniature rotary switches on each module. The house code concept is intended to prevent interaction between neighboring homes supplied from a single utility transformer. The X-10 signals have sufficient range to make this a problem. The various controllers promote this arrangement by making it inconvenient to change the housecode once it has been set.

Thus it is possible to directly control up to 16 unique remote modules. With a little effort a total of 256 remote locations may be independently controlled. In practice 16 unique codes are more than adequate for the average household—at first. Satisfied users tend to expand their system beyond this limitation.

The Commodore Connection

The X-10 Powerhouse computer interface is for the X-10 system which has gone beyond the capabilities of the Timer Console. The Powerhouse appears to be a slightly oversized command console with eight independent on/off rocker switches (for unit codes 1-8). The all lights on, all units off, bright, and dim buttons found on all other X-10 consoles are missing. Also conspicuous by its absence is the house code setting dial.

Internally things are a bit more complex. The Powerhouse sports an 80C48 microprocessor with two kilobytes of RAM. There is also a built-in, seven-day, 24-hour real time clock. The module is capable of storing up to 128 timer events with 256 illustrative icons. A timer event is any number of unit codes on the same housecode programmed to go on or off at a particular time at a specified brightness level on any day or days of the week. For example, modules A1, A4, A7, and A15 programmed to go on at 70% brightness on Mondays, Wednesdays, and Fridays at 7:30 p.m. is just one timer event. Keep in mind that different timer events may have different housecodes. Manual operation of the console is restricted to a single, programmable base house code.

The choice of programming methods is up to the user. Most users will never need more than the X-10 utility program supplied on disk with the Commodore RS-232 interface. This program is designed to be as user friendly as possible, to the extent that advanced users may find it a bit cumbersome. This is a minor drawback when the final application of the software is considered. In fact, you may not use this package for more than 15 minutes two or three times a year to reprogram the Powerhouse. The program is so friendly that the detailed manual is almost superfluous.

Heavy use is made of graphics, starting with a pictorial representation of a seven room house complete with outside front and back. The software then "enters" each room and prompts the user to position up to 11 lights and appliances in each room. These "icons" are chosen from a wide variety of preprogrammed images. Onscreen prompts guide the user through the selection of on and off times, as well as days of the week and brightness level. Units may be "grouped" and duplicate units may be assigned. A total of 95 independent remotes may be addressed by the program.

The software has three operating modes. A demo mode runs through the program's operation without affecting any of the external hardware. An install

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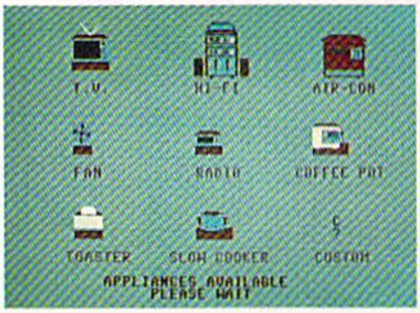

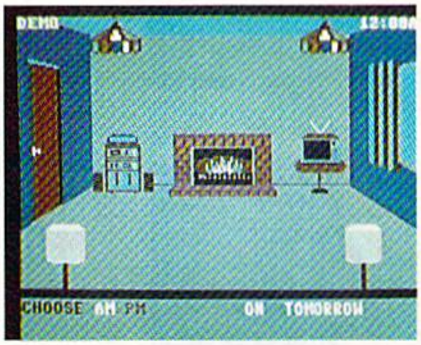

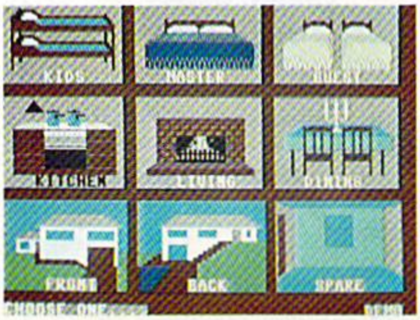

Top: appliance module icons. Middle: wire your living room. Bottom: or your house—up to 256 locations.

mode programs the various functions into the Powerhouse as they are assigned. An operate mode lets you actually exercise the Powerhouse by sending the requested controlling pulses to the various remote modules.

After the Powerhouse has been programmed it may be disconnected from the computer and placed in its final location. The computer is no longer required for its continuing operation. At this point the Powerhouse also doubles as a remote controller for eight units. As with most other X-10 appliances it is simply plugged into an existing power outlet. Power consumption is a minimal 2½ watts. This comes out to about $3.29 per year based on electricity costs in New York City. Most other parts of the country will be cheaper.

To prevent the loss of programmed data during power outages, a 9-volt alkaline battery is housed in the module. This stores enough energy to maintain the data and run the built-in clock for 100 hours.

Before disconnecting the Powerhouse from the computer you should store your schedule on disk. A separate, easy to use utility is provided for this purpose. Its sole function is to transfer the contents of the Powerhouse's memory to disk and back again. This is very convenient for saving summer, winter, holiday, and vacation schedules. Note that the graphic codes for your house are stored in the interface as well as on disk.

BASIC programmers have the option of writing their own code. A utility wedge is included on the disk. This adds nine new BASIC commands to the C-64's vocabulary. These all deal with setting the various Powerhouse functions. The accompanying manual includes detailed explanations, with examples, of each command. An additional program module is included for use when RUNning your BASIC programs which contain X-10 commands.

Advanced programmers have not been neglected. A 35-page programming guide details the operation and programming of the interface, via the RS-232 port, at the machine language level.

Conclusion

The X-10 Powerhouse is an ideal choice for owners of an X-10 system and a Commodore 64, as a replacement for an X-10 system which has outgrown the capabilities of the Timer Console. The accompanying software is well-designed for convenient and easy use. It is too soon to comment on the long term reliability of the Powerhouse; however, we have found the X-10 system components have had an excellent track record.

USA: X-10 (USA) Inc., 185A LeGrand Ave., Northvale, NJ 07647 (phone: 201-784-9700).

Canada: X-10 Home Controls Inc., 1200 Aerowood Drive, Unit 20, Missisauga, Ontario L4W 2S7 (phone: 416-624-4446). *—Morton Kevelson*

MEMORY DUMPERS FOR THE C-64

This Is What Memories Are Filled With

By Morton Kevelson

Back in October we scrutinized *Isepic,* the first of what has become a new breed of C-64 peripherals. The ink was barely dry on our review when ads began to appear for additional products along the same vein. The actual hardware appeared shortly thereafter and here we are again to tell you about it.

For readers who missed the October issue, we are talking about hardware products which at the press of

Isepic: *2K RAM, TTL chips, toggle.*
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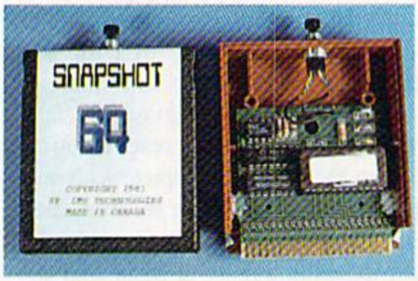

Snapshot *(front);* **Clonebuster** *(back).*
READER SERVICE NO. 227

Capture, *with 8K PROM up front.*
READER SERVICE NO. 228

a button take total control of the computer. The intent of this activity is the transfer of the contents of RAM, as well as all hardware device registers, to floppy disk. The ultimate objective is the creation of a LOADable series of program files which can be used to reinstate the original program's operation at the point of interruption.

Several benefits can be obtained by these operations. Commercial software may be freed from the encumbrances which restrict to the originally purchased disk. The lifting of these restrictions allows a copy of the program to be conveniently placed on the same disk as its resultant data. Transference of the application from the 1541 format to a higher capacity drive (an SFD-1001 or a hard disk) becomes an alternative. Lengthy opening screens and other introductory material may be bypassed. Even BASIC programs may benefit by the saving of all initialized variables and arrays along with the program.

With these considerations in mind we take a look at the products which have been introduced subsequent to our *Isepic* review. We examine some new and unique features provided by these latest offerings.

SNAPSHOT 64 (originally CODEBUSTER)
LMS Technologies
Available from
(In Canada):
Marshview Software
P.O. Box 1212
Sackville, New Brunswick
Canada E0A 3C0
Price: $49.95 + $3.50 shipping
(In the USA):
CSM Software, Inc.
P.O. Box 563
Crown Point, IN 46307
Phone: 219-663-4335
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or as
CLONEBUSTER from:
Micro-W Distributing Inc.
1342B Route 23
Butler, NJ 07405
Phone: 201-838-9027
Price: $49.95 + shipping

This cartridge plugs into the C-64 expansion port where it benignly awaits its cue—a simple press of its button. Upon the occurrence of this singular event all computational activities apparently cease. This is totally deceptive. Behind the now blank screen and placid exterior, the computer awaits further instruction via its four function keys and RETURN key. Lest you forget, a convenient paper overlay is provided with the CSM version as a functional reminder.

The first step in *Snapshoting* or *Clonebusting* is a press of the cartridge button followed by the f3 function key. This sets the computer to its power-on state with all of RAM preinitialized to a predetermined value. This lets the four-kilobyte operating system in the cartridge ROM distinguish between a newly loaded program and unused RAM.

At this point simply boot your original software in the approved fashion. Once your application has reached the desired state, simply push the cartridge button once again. If for some reason you were hasty or with the button press, just hit the f7 key. This should start things right up again where you left off. Otherwise hit the f1 key and the memory save process begins—provided you have remembered to prepare a formatted disk to accept the ensuing binary regurgitation. What's that? You have neglected this essential step? Fear not! The f5 key will perform the identical function while first formatting the disk.

The manual recommends that the disk drive be reset before starting the *Snapshot 64/Clonebuster* operation. On the SX-64 simply push the drive reset button. A 1541 or other separate drive should be turned off and back on. We found that more often than not this would also force a reset of our C-64, which seems to have a power supply sensitive to these things. Carefully removing the disk drive serial bus cable and reinstalling it after resetting the drive seemed to alleviate the problem. Our C-128 is apparently immune to these drive reset activities (as well as many other power line phenomena which have aggravated our C-64's).

The *Snapshot 64/Clonebuster* op-

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eration creates seven files on your disk. These include a stand-alone boot routine which does not require the continued presence of the cartridge. The *Snapshot* manual describes the contents of these files in adequate detail. The *Clonebuster* manual neglects to provide this interesting and potentially useful bit of information. Unlike the other two memory dumper products we have seen, *Snapshot 64/Clonebuster* does not provide its own fast load routines. However, the resultant files may be compatible with commercially available fast loaders. We found the Epyx *Fast Load* cartridge worked just fine.

The *Snapshot/Clonebuster* autoboot routine displays the assigned program name along with a "BACKUP – NOT AN ORIGINAL" message on the monitor screen while the program is LOADing. This will be an embarrassment to some, mildly disturbing to others, and of no particular consequence to most. Any feelings of anxiety may be alleviated by simply turning down the brightness control on your monitor.

Snapshot 64/Clonebuster offers one final feature for the technically adept. Hitting the RETURN key after pressing the cartridge button will display the vital processor statistics at the instant of program interruption. These include a readout of all the processor registers as well as the IRQ and NMI vectors, the 6510 on-chip I/O registers, the VIC II chip IRQ mask and raster compare latch value, and the CIA ICR mask values and timer latch values. At this point you will have the option of LOADing your own machine language routine such as a machine language monitor. Or you may resume execution from any address, display the contents of a range of memory (in hexadecimal), or exit to BASIC.

The *Snapshot 64/Clonebuster* cartridge is easy to use. We found that it worked well with the C-64, the SX-64, and the C-128 in C-64 mode.

CAPTURE

Jason-Ranheim
580 Parrot Street
San Jose, CA 95112
$39.95 + $3.00 shipping
Phone: 800-421-7731; in CA 800-421-7748

When Jason-Ranheim is mentioned we immediately think of PROM programming and the Promenade (see *Ahoy!*, July 1985). The *Capture* cartridge is no exception to this rule. Its ultimate destiny goes beyond the mere transfer of the contents of C-64 memory to disk. In its final configuration *Capture* will support the creation of cartridge-based software in user-programmable PROMs from your existing disk-based programs. As of this writing, the PROM programming feature had not been implemented. Look for an upgrade ROM to relieve this deficiency early this year. We will report only on the disk-based activities of *Capture*–which still gives us plenty to say at this time.

The *Capture* cartridge contains its own eight-kilobyte operating system in a PROM set in an IC socket for easy user upgrade to the latest version. Also on board is eight kilobytes of static RAM. It is this large operating system with ample RAM which gives *Capture* its power and flexibility. Also present in the cartridge are several logic chips and the mandatory pushbutton to set the whole thing off.

The first use for the onboard RAM is as a storage buffer for the screen memory, and other vital C-64 statistics, when the *Capture* button is pressed. This allows *Capture* to initially display a detailed conscience message followed by a complete operating menu. What could be simpler?

As with other memory dumpers, *Capture* gives you the option of preconfiguring RAM. This allows *Capture* to save only the contents of RAM used by the application program. *Capture* files are all exactly two kilobytes long. Thus up to 32 files may result from a complete memory dump. The file names are indicative of their starting address. This will allow you to easily go back and analyze the *Captured* program. The

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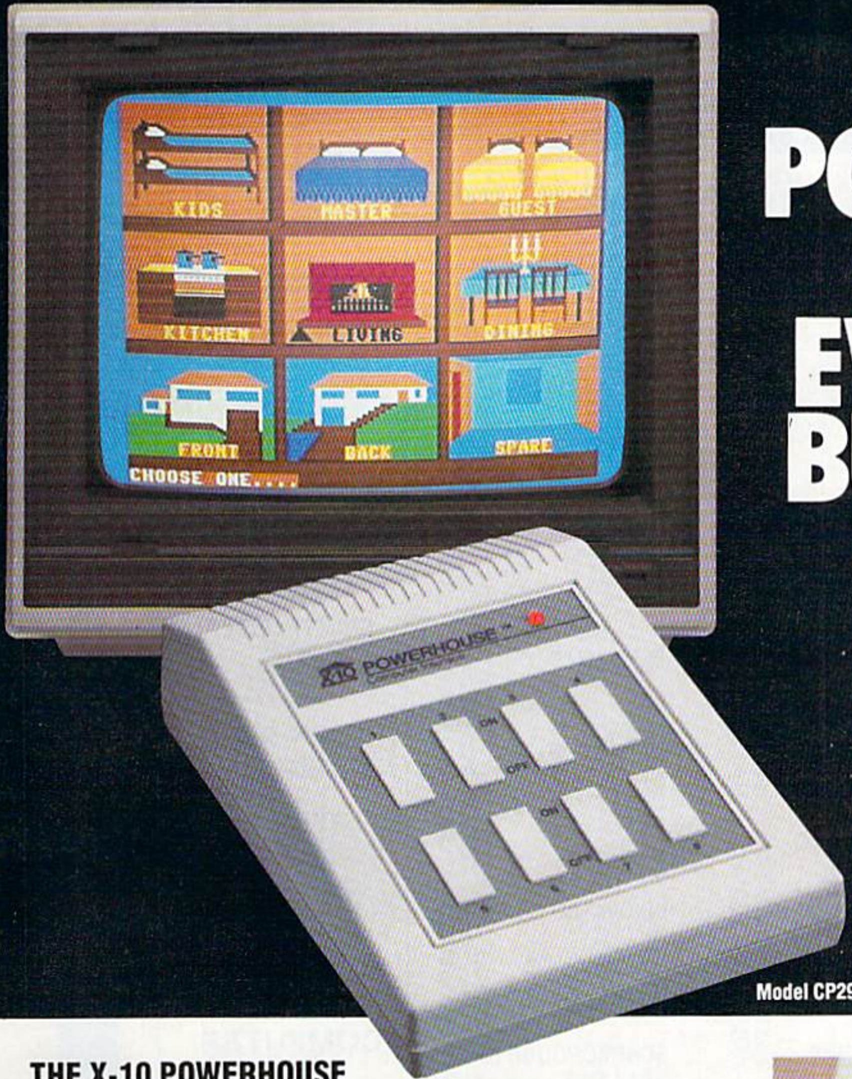

Model CP290

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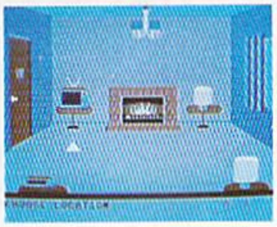
SPECIAL COLOR GRAPHICS MAKE PROGRAMMING A SNAP. You simply pick a room from the display screen. Use your keyboard or joystick to position graphics of lights or appliances. Then follow on-screen instructions to program any light or appliance to go on or off whenever you choose. You can even control thermostats, light intensity and more.



THE WAY IT WORKS. The X-10 Powerhouse Interface is cable-connected to the Commodore "User" port and plugged into a standard 110V outlet. After it is programmed, the Interface sends digitally encoded signals through your home wiring to special X-10 Modules. To control a lamp or appliance, you simply plug the electrical device into a Module and then plug the Module into an outlet. The Interface can control up to 256 Modules throughout your home and won't interfere with normal use of lights and appliances.

There are plug-in Appliance Modules, Lamp Modules, Wall Switch Replacement Modules and Special 220V Modules for heavy duty appliances such as water heaters and room air conditioners. Plus Thermostat Controllers for central heating and air conditioning, Telephone Responders to control your home from any phone, and much more.

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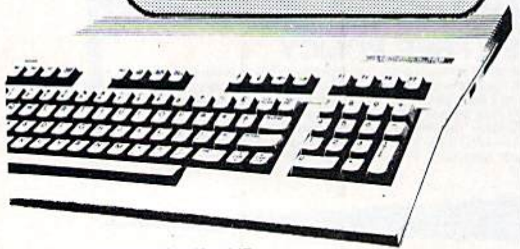

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Capture menu also lets you display a preview table of RAM used by your program.

Five additional files will appear on the *Capture* disk. These are the C-64's I/O data and program boot files. *Capture* also lets you save the contents of the disk drive's RAM, although only for informational purposes. A fast boot routine is included for 1541 users. Even with the fast boot routine, a 64-kilobyte *Captured* file took nearly one minute to LOAD. This time can be cut nearly in half by combining the various two-kilobyte modules. The manual gives complete instructions on this procedure.

If you transfer the *Captured* files to another disk, be sure to use a disk sector editor to copy blocks 15 and 18 on track 18. The data for the 1541 fast boot routine is stored here. The programs will not LOAD without it. Other disk drives which do not use this fast boot routine will work just fine. For some reason the manual leaves out this vital bit of information.

The next menu option lets you create a stand-alone disk image of the program currently in memory. You may select both the drive and device numbers for your output files. Thus separate drives can be used for booting your original program and *Capturing* the result. You must remember to have a preformatted disk on hand, as *Capture* does not offer a disk format option.

The last two menu items hold the promise of *Capture's* future. Neither of these options were implemented as of this writing. First there is the create a PROM cartridge option. To use this you will need a Promenade PROM programmer ($99.50) and a CPR3 cartridge kit ($29.95 price includes three EPROMs). You will not need a high school graduating class. *Captured* programs placed in PROM will be instantaneously available on power-up as plug-in cartridges. We intend to report on this option when it becomes available.

Capture's final option is intriguing to say the least. Jason-Ranheim intends to publish a number of application programs which will LOAD into and RUN from *Capture's* onboard RAM. These utilities will operate on your raw captured data to, among other things, automatically link the *Captured* two-kilobyte modules. Specific details of these other things were not available at press time, but we expect they will have something to do with PROM programming.

Capture is easy to use, being virtually foolproof in its basic operation. The proposed PROM programming powers hold great promise from our point of view. The version of *Capture* we looked at did not work with the C-128 in C-64 mode. According to the company, this was due to differences in the prototype C-128 from the current production models (a problem we can sympathize with, having been bitten by the same bug). The *Capture* upgrade PROM is expected to solve this problem as well as incorporate the PROM programming feature. If C-128 compatibility is important to you, check with the manufacturer for the latest word before ordering.

IN RETROSPECT

We reviewed *Isepic,* forerunner of the current crop of memory dumpers, in October. While *Isepic* did not do bad as a forerunner, it does not measure up to the products reviewed here, each of which has its operating system in ROM (eliminating the need to boot up from disk), compacts files in a single step rather than as a separate operation, and allows dumped programs to run as stand-alone routines, without the presence of the parent cartridge.

With regard to the ability to provide a working dump of commercial software, all these products were about equal. Programs which resisted the efforts of one cartridge resisted the efforts of the others as well. None of the cartridges could cope with software which performed multiple disk access for copy protection. Custom DOS routines will also act to stymie the efforts of these products. The memory dumpers are best applied to increasing the convenience of older, but still revered, programs in your library.

Continued from page 12

But better results for Amiga and C-64 users alike may be provided by a new high performance graphics tablet about to be imported from England. The product provides a resolution of 1280 by 1024 points, accuracy and repeatability of one pixel, and a data transfer rate of 2000 coordinate pairs per second (over the C-64 user port). Full-featured graphics software will be included. For more information contact Educational Systems International, 1311 Page Avenue, Southerline, OR 97479.

BETTING PROGRAMS

Softech's *Horseracing Handicapping* package comprises three C-64 programs, all on one disk or cassette for $29.95.

The *Thoroughbred* and *Harness Racing Forecast* (that's two) programs take into account only the most important data elements, as supplied by the racing form. The programs perform the analysis, output ratings, and sort and order the favorites.

Wager Return Analysis tracks win, place, and show finishes and percentage gains at the track or betting parlor.

The Softech Group Inc., P.O. Box 582, Keego Harbor, MI 48033 (phone: 313-851-4925).

For registered owners of the *Pik-Em* football program (see November '85 *Scuttlebutt*) who did not wish to spend the 20-30 minutes required each week to extract the required input data from the newspaper, Indeco will make available a weekly update. The user can receive each week's results by modem or by regular mail (is that still around?). Price of the service is $40 per year.

Indeco, 133-A W. Chapman Avenue, Fullerton, CA 92632 (phone: 714-526-1297).

VIDEO TITLES

The *Video Title Editor* ($29.95) allows the C-64/VCR owners to put titles, custom messages, and colored screens on video tapes. Over 20 displays are included, covering birthdays, anniversaries, weddings, vacations, video mail, and video movie credits. The program will also produce custom displays.

The Softech Group, Inc., P.O. Box 582, Keego Harbor, MI 48033 (phone: 313-851-4925).

FONT PROGRAM

Flexifont ($29.95), a font and character generation software package designed for use with Flexidraw's light pen, offers 33 ready-to-use letter styles and the ability to use and adapt captured fonts or create custom lettering, foreign characters, symbols, and patterns by using the light pen to fill in individual pixels. Created symbols or fonts can be saved to disk, and are accessible by the program's editing features of copy, paste, flip, rotation, and four directional movement.

Inkwell Systems, 7760 Ronson Rd., #210, San Diego, CA 92111 (phone: 619-268-8792).

DISK CATALOGUER

A disk cataloguing system with a capacity of 640 disk directories and 5000+ program titles, *SuperCat* ($29.95) provides automatic entry from the catalogued disk's directory with selection, editing, and cross reference capabilities. An alphabetized listing of up to 5000 titles is produced using an ML sort capable of sorting 1000 titles in eight seconds. Listings by disk and title are supplied in compact multicolumn reports.

Cornucopia Software, P.O. Box 2638, Portland, OR 97208 (phone: 503-293-3437).

PROMAL UPGRADE

Registered owners of earlier versions of Promal can now upgrade to the just-released Version 2.0 for $10.00. The list of improvements is far too extensive to reprint here, but included is a new, easier LOAD procedure, support for multidimensional arrays of all data types, built-in T device for telecommunications support at up to 9600 baud, a utility that doubles the speed of disk reads from the 1541, and a Relocate utility that converts any assembly language program into relocatable form.

Systems Management Associates, P.O. Box 20025, Raleigh, NC 27619 (phone: 919-878-3600).

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CREATING YOUR OWN GAMES

Continued from page 23

to us. We have to go through much more painful processes to learn to think in another way, with another vocabulary. It takes far more practice and repetition. And it isn't *fun* anymore.

What I'm saying in such a roundabout way is that learning is intrinsically self-rewarding. Learning is *fun*. But not if you're not ready for it, and not if you've already learned it.

That's what you remember as "boring" in school. You remember the times when the teachers were saying stuff that was just too hard. You didn't understand it—it was "dull." Or you remember the times when the class was still going over the same stuff, after you'd already mastered it and lost interest. But the times of real learning are never dull.

Unfortunately, times of real learning don't always happen in school. If you're a pessimist, you might even say they don't often happen in school. And for some people, they don't ever happen in school.

THE ARCADE AS ELEMENTARY SCHOOL

But you can see the process at work in the neighborhood video arcade. Adult or child, it's the same. You go in with a friend, you show him your favorite game. He tries it a few times, but he gets killed immediately and then has to stand there watching you finish out your turn. You can see that he's bored. He wanders off. When you finally finish your game and record your score, you look for him. There he is at something ancient. *Donkey Kong,* for Pete's sake. But he's having a great time. Because he doesn't get killed right off. It's still a challenge to him.

When the game is brand new, you try it out—but you quit pretty soon if it's too easy. You also quit if it's too hard. But if the challenge is good but not impossible, you go for it. You practice the same game over and over again, slipping those quarters into the metal slit, until you learn the game, really learn it.

What are you doing?

Acquiring habits by repetition. Just like the teachers wanted you to do with the multiplication tables.

SO WHY DON'T THOSE EDUCATIONAL PROGRAMS WORK?

They don't work because the educational game hacks have seen what I just described to you and they haven't understood it at all. They saw the kids going into the arcades and playing for hours, so they figured, let's make our educational program look like the arcade games, and then maybe kids will play them and learn!

The result? Utterly stupid *Space Invaders* rip-offs in which you have to zap the correct answer before it makes it to the ground.

That same idiotic mentality is what leads untalented television programmers to figure that if the *Bill Cosby Show* is a hit, then all they have to do is put on a show that looks like the *Bill Cosby Show* and they'll have another hit. What does the Cosby Show have? It's got a black family—so our show will have a black family, and it'll be a hit too, right?

Unless the American people are really stupid, it had better have a lot more than a superficial resemblance to the Cosby Show. It had better be good on its own terms. It had better be true to itself, or it'll find itself in the Nielsen ashcan before Christmas.

Same thing with educational games. Learning isn't nasty medicine that you have to disguise as candy before kids will take it. Kids *love* to learn—at the right time. When they're ready.

And when they're ready, the learning is its own reward. It tastes sweet, all by itself.

Kids are not dumb. They know hypocrisy when they see it. They know fake games, and they know fake learning, and by and large they reject them both. If they love you—a lot—they'll pretend to like it long enough that your feelings won't be hurt. But you'll find that disk gathering dust at the back of the box.

DON'T BE ASHAMED TO TEACH

My wife and I both work in situations where we train volunteer teachers. The program we work with is full of educational theory. Lots of great suggestions—like visual aids, buzz sessions, all kinds of cute little techniques.

But my experience—in public schools, colleges, and every other learning institution—is that the good teacher doesn't need that stuff. The good teacher loves the subject matter and knows how to tell about it. If the students are ready for it, they pick up that excitement and run with it. The tragedy of the grade schools is that they have grouped children by age instead of learning readiness. The infuriating thing is that the educational theorists have made the situation even worse by forcing cute time-wasting techniques on the teachers.

Never mind about that. I can't change the world with a column in a computer magazine, and you read this column to find out about programming, not Uncle Orson's diagnosis of the sickness of American public education.

But I can tell you this:

Computers *are* terrific tools for teaching, but not when you misuse them. You can't fake it—learning is learning. You should make it attractive, but you shouldn't try to make it "feel like a game." Because that usually means making it feel like a different game, instead of letting it feel like the game of learning.

If you think you can use your computer to get your kid to learn things earlier, to get the jump on kids who don't have computers, then you're going to be deeply disappointed—unless your kid happens to reach a window of learning before his class at school comes to it. Then if you have the right computer program, he'll go crazy over it. Until he's mastered the subject, and then it'll be boring again.

If you think you can use your computer to replace the human process of teaching and explanation, forget it. There's no computer in the world that can do .0001 percent of *real* teaching—looking at the kid and guaging comprehension and interest, persuading the kid you love him and care about him, getting him excited in the subject, probing, trying new ways of explaining in order to get past mental blocks—stuff that we've been underpaying good teachers to do for years. Stuff that can't be taught in Colleges of Education, because it's a natural part of being a human being who knows things and wants to share them. Besides, the kid knows when he's been stuck with the computer because the teacher—or the parent—doesn't have time for him. It doesn't make him like learning. It makes him hate computers.

But if you're watching your kid, if you see what he's interested in, then the computer can be wonderful. All it takes from you is your time and interest—and maybe some skill at programming.

MAGIC PAPER

When I was eight years old, I read Twain's *The Prince and the Pauper.* I was so enthralled that I never wanted to leave the world of that book. I became a lifelong anglophile. I pored over the World Book Encyclopedia biographies of all the kings and queens of England. I studied maps. I lay awake at night visualizing a map of the ancient kingdoms of Wessex, Essex, Mercia, East Anglia, Sussex, Northumbria. And the old countries. And generational charts of European royalty. I was obsessed. By the time I got to high school, I knew more about European history than any of my teachers. I drove them crazy by not letting them get away with any errors–or even any vagueness–in class. Not surprisingly, most of them did not welcome my contributions. Alas, they did not recognize that what they were seeing was not a troublemaker, not a smartmouth, but rather a kid who loved the subject matter.

One teacher, though–Tom Babb, how's that for a memory?–saw what was going on. It was American history, but by then my hunger had spread to include the entire past of the human race. He didn't do much. Just gave up a few hours after school now and then, talking. Tossing out questions and problems, making observations, making me *think* about things. We became friends. He even let me write the joke final exam for the class. Most of the kids didn't realize how funny those impossible questions were–but Mr. Babb did. I suppose I learned other things that year (in fact, I know I did), but the one teacher from that year in school, the one who gave me a gift that stayed with me, was the teacher who saw what I was hungry for and fed me.

That's the kid you're reaching for when you prepare a real learning game. Not the kid who hates the subject or who isn't ready for it or who already knows it. You're conversing with a kid who wants to learn this subject. Who wants to master it, as long as it's within his reach.

Now, you can wreck it for the kid, even if he's foaming at the mouth to learn about your subject. You can write a program that doesn't communicate anything. That never surprises him. That treats him like an idiot. That confuses him. You do enough stuff like that, and sure enough, you'll make even the subject that he loves seem dull.

What you need to do in creating a good educational game is remember that you can't possibly replace the human being who sits around and tells stories or explains things while carefully reading the silent feedback of the student's face. The computer deals on the simplest level.

It helps if you think of it as a piece of paper that changes magically.

Then you find things to do with that paper.

DINOSAURS

My seven-year-old, Geoffrey, really got into dinosaurs last year. Lots of kids go through a dinosaur phase. What kind of game could you do with dinosaurs?

You might have a series of computer flash cards–dinosaur shapes, which the kid has to name. That's really dull if the kid doesn't care about dinosaurs. But if he's in the first bloom of love with those big old beasts, it's a terrific game.

But why stop there? Why not make them out of sprites and animate them on the screen?

Or how about this. You've got a picture of an environment–water on the edge of the forest. Then along the bottom of the screen you have a half-dozen dinosaur pictures. The kid moves a cursor to one, presses the joystick button. The dinosaur is immediately placed in the environment.

Say he chose a brontosaurus. It stands in the shallow water, eating trees. Eating *lots* of trees. The trees start disappearing. A number under the brontosaurus picture gives the total number in the brontosaur population, and it's way out of hand. Pretty soon the brontosaurs have stripped the forest and the whole ecology is in danger.

But the kid pops down to the menu and chooses a tyrannosaur. To him, the brontosaurs are lunch. Things settle down.

You get the idea. Maybe that one's too hard to program, but that's the way you think. You don't try to teach about dinosaurs by programming a *Pac-man* rip-off, only the bad guys are tyrannosaurs and the good guy is a stegosaur. You try instead to give the kid a chance to show off how much he already knows–and at the same time surprise him with stuff he didn't know yet.

THE MOST AND THE LEAST

The game program included in this issue of *Ahoy!* is as simple an educational process as you can get. You've seen it a thousand times on class handouts. You're shown a list of things, and you have to arrange them in order.

Dull, right? Not really. It depends on what's in the list. When I was twelve years old, and completely crazy about the Civil War, I would have had a great time with a list of, say, major battles of the Civil War. Especially if my parents were playing with me, I would have had a great time showing off how much I knew.

But I might have been surprised to realize that Grant took

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Ft. Donelson so early in the war. I might have thought that came a little later. So I'd learn something. And in a very short time, I'd have a mental picture of the order of events in that war. A sense of the flow of time.

Or say you've got a kid who's crazy about maps. What about a list of the states of the eastern seaboard, all the way from Maine down to Texas? Then Dad bets the kid he can do the list better. He takes the challenge, and they both score some points.

You get the idea. If the kid doesn't care about maps, the game will be unbearably dull. If he loves maps, it's fun—*more* fun if his parents are an audience or even a participant.

What about a list of Super Bowl winners and losers for the kid who's crazy about sports? Or for a youngster who's just making sense of time and space, lists of days of the week, months of the year, holidays of the year, weights and measures. Or for a voracious reader, famous works of literature.

When you think about it, isn't this exactly the kind of thing that adults spend hours doing in *Trivial Pursuit?* Showing off how much they know. And when they don't know, making wild guesses that sometimes, incredibly, are right on the money. And even when they're wrong, learning something and saying, You're Kidding! I never knew that!

Jeopardy is making money on TV right now. Just a bunch of questions and answers. Testing knowledge. Sure, there are money prizes. But the audience doesn't get those prizes. In fact, the audience pays for the prizes by putting up with commercials. Why do they watch?

Because it's fun. Knowing stuff is fun.

But none of these lists will be fun for long. That's why *Trivial Pursuit* and *Jeopardy* have to come up with new modules or new series installments. After a while, you know all the stuff and you need something new.

So I've designed the game *The Most and the Least* to be modular. The game itself searches the disk directory for files that start with a Q followed by a space. It assumes that all such files are sequential files that contain up to eight quizzes each, loaded in the exact order that the program expects. It lets the player choose which quiz file to play from, then loads the file and presents the quizes in random order.

Included in this issue's program listings is the module *Which Is...*, a group of trivia quizzes for young kids who are just learning about calendars and measures. Three other modules are included on this month's *Ahoy!* Program Disk (see page 53): *U.S. History, U.S. Geography,* and *World Geography.* Sorry—all three are quite long, and space for them in the program listings section did not exist.

Each quiz consists of a list of up to 20 entries. For instance, in the quiz "Major Battles of the Civil War," the list would consist of battle names like Chicamauga, Shiloh, The Seven Days, Antietam, Gettysburg. The player moves a cursor from battle to battle, and presses the button or space bar when the cursor points to the battle that he thinks happened first. If he's right, the game says "Right On" and gives him a bunch of points—more points if it's early in the quiz, fewer if it's late in the quiz when there are fewer entries to choose from.

Whether he's right or wrong, though, the program puts the correct answer in place. It also adds an additional fact about that entry—the date, in this case—to the right of the entry on the final list.

By the end of the game, the player and the program have rearranged the original scrambled list. Now it's in the correct order—with facts displayed alongside.

The kid who loves the Civil War gets to show off a little of what he knows. But maybe he also says, What is this? Vicksburg fell after the battle of Gettysburg, and this stupid program puts it first! So you look at the date together, and realize that the *siege* of Vicksburg began weeks before Gettysburg.

Then, when this quiz has lost its appeal, you get more specific. How about a list of the minor battles in the Peninsular campaign? The Shenandoah campaign? If the kid knows computers at all, you teach him how to make up his own quizzes. Then you find yourself sitting down after supper to face a list of naval battles of the Civil War, and the rotten kid laughs when you can't get any of them in the right order (except the last entry, of course, but you don't get any points for that). But you do it a few times and pretty soon you get most of them right.

And then you make the best discovery of all. Your kid learned more in trying to create a quiz for you than he learned from the quiz you created for him. Surprise surprise. Preparing to teach teaches better than any "learning" program.

While *The Most and the Least* is the actual game, it's the program *Quiz Maker* that you'll use to create your own quizzes. All you need to do is:

1. Set the variable NQ to the number of quizzes your game will include. This can be anywhere from 1 to 8.

2. Set the filename variable FF$ to the name you want the file to have. The program automatically puts a Q and a space at the beginning of the filename.

3. Then you type in the data. Each quiz can have anywhere from 1 to 20 entries. At the beginning of that quiz's program lines (I begin quiz 1 at line 100, 2 at line 200, etc.), there is a DATA statement with nine items of data. First is the number of entries in that quiz—from 1 to 20. It is followed by the four background colors in extended background color mode, and the four foreground colors used for each "window" in the program. If you don't know what that is, never mind. Just don't *change* those numbers.

Next come the title and format lines—the top two lines of the screen, each consisting of exactly 39 characters. You can put what you want there.

Then the two header lines, which explain the columns of "entries" and "facts" below them.

Finally, each entry consists of a 20-character string that will appear in the scrambled list. It is followed, in the same DATA statement but after a comma, by a 17-character "fact" that tells more information.

Simple as can be. Just don't change the number of characters in any entry, and you can put any characters you want in those positions. Of course, the title and header lines are in SHIFTed characters, so you'll find it a lot easier to type them in if you first, in direct mode, enter this line:

```
POKE 53265,PEEK(53265)OR 64
```

This puts you in extended background color mode, so that when you type SHIFTed characters they show up as letters instead of graphics characters—the way they will in the final game.

The actual workings of the program *The Most and the Least* are explained at the end of this article, where I always put the technical stuff.

WRITING LEARNING GAMES

1. The first thing to remember is that no data-dependent

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learning game will last very long. Once the kid has pretty much learned the stuff, then that game (or at least that data module) is dead for him. Likewise, the game might be too much for the kid–too many entries, or not enough interest, or the kid might not be ready yet. So your time spent making the list might be "wasted." (Don't kid yourself, though. It means more to the kid than he realizes himself, when he finds out you spent a few hours doing the research to prepare a quiz game for him. But that's another kind of teaching...) Don't get mad if the kid doesn't play your game. Just write another. And make sure you create a game that fits *his* interests.

2. Make the game fit the subject matter. This list game, for instance, only works with things that can be put in a measurable order. It would be dumb to use this list format to teach "The Ten Greatest Musical Compositions of All Time," or, for that matter, the multiplication tables. The list game works with information that can be put in permanent, meaningful order. It isn't worth anything with "parts of speech." You'll have to find another game approach for that.

3. Make the game fit the child's level. What good is it to create a list game for a kid who can't read? But a game that uses sprites or custom characters to make recognizable pictures isn't a bad idea for a non-reader.

4. Make sure the game is testing for the thing you want to teach. For instance, when I bought my first home computer–an Atari 400 back in the dark ages–I also bought a *States and Capitols* game. Great map of the U.S., but the game did *not* teach kids to recognize the shapes and locations of the states.

That's because it was possible for a kid to know the name of the state and still get it "wrong." Why? Because the kid had to type in the name of the state. It wasn't testing map-reading and memory of geography, it was testing spelling.

Worse yet, it wasn't even doing *that* very well. Because the program tested only the first five letters of the player's answer. If you think a minute you'll realize that this means that the game can't distinguish between NORTH CAROLINA and NORTH DAKOTA.

The program saw both answers as merely "NORTH." So you end up with a program that shows you South Dakota and tells you you're correct when you type SOUTH CAROLINA–and then shows you Tennessee and says you're wrong because you typed TENESSEE.

The most annoying thing is that it could have been wonderful. The Atari was the best graphics computer you could afford to buy, period–right up until the Amiga was introduced this last year. With some easy techniques –mixed screen modes, for instance–you could have had the map and then used the bottom few lines of the screen to display a scrolling list of the names of all the states. The map displays a state, and instead of spelling the name of the state, the kid scrolls until he finds the name. Sure, it means he can guess blindly and sometimes get it right. But if he guesses often enough, he knows the answer. That's what rote learning is all about.

That's where the computer becomes the "magic paper." It can move. It can dazzle. It isn't just faint blue ditto on a single sheet. The colors change, the cursor moves around, words jump here and there, and all of it responds to what the player–the kid–chooses to do.

That's the most important rule of all. Make it respond to the kid. Let the kid feel like he isn't being forced to do what the computer tells him to do; he's making the computer do what *he* wants, within the rules of the game.

HOW THE PROGRAM WORKS

The program is set up using two subroutines. First, the memory and video setup subroutine at 1000:

1000	Move the top of memory down below 35K. Screen memory (VM) will be at 35840.
1002	Set video block to the block from 32K to 48K.
1004	Set character memory to 40K ("under" BASIC ROM, which is invisible to the VIC-II video chip) and screen memory to 35K.
1006	Set extended background color mode and set the initial background colors.
1010-1018	Copy the ROM character set into character memory, then replace the shapes of the period, up-arrow, and left-arrow with custom characters. The period remains a period–but shifted left within the character space, so that you don't have to leave a space after it in DATA statements. The up-arrow becomes a comma, also shifted left so you don't have to leave a space. More important, though, is the fact that a regular comma cannot easily be placed within a string in a sequential disk file, because then you try to read it back out, the comma is interpreted as a record separator. By typing in up-arrow characters, you can put commas into DATA statements that will still be there when it's time to PRINT them out during the game. The left-arrow character is replaced with a fancy cursor character–which points to the right.
1020-1021	Set up vertical movement strings. If you've been following this column, this is quite familiar to you. Each string in the array VV$(0-24) consists of a HOME character and the same number of cursor-down characters as the index number of the array. That is, VV$(0) contains a HOME and zero cursor-down, while VV$(24) contains a HOME followed by 24 cursor-downs. This lets you put the cursor anywhere you want it on the screen by PRINTing the right VV$( ) string followed by the TAB( ) function. To PRINT at column 12 (the thirteenth column, numbering from 0 to 39) of line 15 (the sixteenth column, numbering from 0 to 24), you'd use this line: PRINT VV$(15)TAB(12).
1023	Set up a master string consisting of ASCII characters 0 through 21 in order. This string will never be PRINTed. It's the numerical values of the ASCII characters, not the characters themselves, that are used here.

The next subroutine executed is the file-loading and screen setup routine at 900:

900-901	Clear screen, PRINT game title, set background and border colors, and PRINT directory message.	
902	Go read the directory using the subroutine at 1040:	
	1040-1055	Read the directory. This routine opens the directory file "$" and GETs one character at a time. By counting the correct number of characters, you can find the filenames in the directory. This routine is very primitive. It does not test for scratched files–all it cares about is finding files that begin with "Q"–a Q and a space. So if you scratch a quiz file, SAVE some file with a non-"Q" filename into the same space, even if you delete it later. Next month we'll do a more sophisticated read routine, so you can see it done right.
903	If no files were found beginning with a Q and a space, give the error message and quit.	
904-906	PRINT the quiz files and the instructions.	
910-915	Read the joystick and the keyboard to get player input, using the routine at 50. The cursor moves up and down with the joystick or the f5 and f7 keys; a selection is made with the space bar or the button. The cursor, contained in string CU$, moves from selection to selection.	

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920 If the QUIT option was chosen, go to the ending routine at 1080, which restores the video block and reenables the RUN/STOP-RESTORE interrupt.

921-922 Display the filename the player chose.

930-942 Read the information from the quiz file in the exact order in which it was put on the disk by the *Quiz Maker* program (or any of the other quiz programs in this issue).

944-946 Go set up the random order of all the lists, using the string setup routine at 1070. We have used the "shrinking string" technique before in this column. Keep in mind that these strings of characters are never PRINTed on the screen. What matters in them is the numerical value of the ASCII codes of these characters. If there are 20 entries in quiz 3, the string QR$(3) would be loaded up with the 20 characters with the ASCII codes from 1 to 20–but not in correct order. The list, you'll remember, was in correct order on the disk and therefore is in correct order in the string array QE$( ). When it comes time to PRINT the scrambled list, the entries will be PRINTed in the order of the ASCII codes of the characters in string QR$(3).

948 Go set up the string used to create the animated prompt line. It consists of the word NEXT followed by four left-arrow (cursor) characters. This pattern is repeated four times–once regular, once SHIFTed, once REVERSEd, and finally REVERSEd and SHIFTed.

950-957 Initialize the screen for a new quiz. Each time a new quiz is set up, the setup sequence is entered at this point, and continues through to the end. These lines find out which quiz is next (the quizzes are chosen randomly, using the string RR$), set the background colors to the correct values for that quiz (line 953), clear the screen, and PRINT the title, format, and headers.

960-968 Refresh the list displays. Each time an answer is given, the setup sequence is entered at this point, and continues to the end. This routine affects only the screen lines from 3 to 24. If any answers have been given, the correct entries and facts are displayed by the loop in line 962. Then, if there remain any unselected entries, that portion of the random list is PRINTed by the loop in lines 965-967. The bottom line displays the QUIT option and the score (ten times the variable TP).

969-971 Test for the amount of space left in memory. If there's not enough left, PRINT a pause message and perform a FRE( ) function to clear out string garbage. With 8 quizzes of 20 entries each, this operation takes only slightly less time than forever. But if we don't do this, memory fills up and we either crash or get really ugly things happening in video memory.

After the setup routines are through, the program jumps to the main loop at line 100. The routine from 100 to 140 gets player input (using the routine at 50) and either moves the cursor or jumps to the answer-handling routine at 200.

200 Set the variable V to the current position of the "NEXT" prompt line and erase that line using the blanking routine at 70. If the QUIT option was chosen, go to the QUIT handling routine at 300.

202 Check to see if it was the right answer, and jump to the appropriate routine.

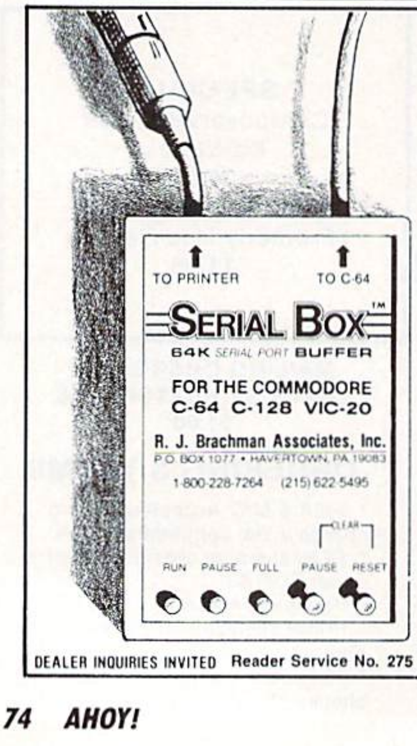
210-216 The answer was wrong, so reduce the score by 1, find the correct answer, put the cursor into position so it points to the right answer, display the error message, and jump to 250.

230-232 The answer was right, so increase the score (depending on how high this entry comes on the list) and display the "RIGHT ON" message.

250-255 Erase the cursor, blank the line where the NEXT prompt will now be displayed, shrink the random-order string QR$( ), and then use the screen refresh routine at 960 to display the new list configuration. Line 251 also tests to see if this quiz has been exhausted. If so, the routine jumps to 280.

280 This quiz is over, so PRINT a prompt and wait for the player to tell us to go on. When he does, test to see if there are more quizzes left to do. If so, select the next quiz and jump to the new-quiz routine at 950. If not, jump to the quit-handling routine at 300.

Several conditions can bring us to the quit-handling routine at 300-371. The routine is fairly long but its function is simple. It lets the player choose whether to resume play at the point where he selected QUIT (in case that selection was an accident), start over with the quizzes from the current quiz file, go back to the directory and get a new quiz file, or quit altogether. The "go back to the directory" option consists of issuing a RUN command and starting the program over. I don't recommend this procedure, but laziness won out over the more correct process–going back and moving all my DIMension commands out of their current positions.



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SEE PROGRAM LISTINGS ON PAGE 115!

This month's edition of *Creating Your Own Games on the Commodore 64* is accompanied by two programs that allow you to generate your own trivia quizzes: *Quiz Maker* (page 115) and *The Most and the Least* (page 117). Also included is an add-on module, *Which Is...* (page 120).

Three more add-on modules are included on this month's *Ahoy! Disk: U.S. History, U.S. Geography,* and *World History.* Space limitations prevent us from including them in the magazine. See page 53 for information on ordering the *Ahoy! Disk.*

FLOTSAM

We're tired of letters praising us to the skies! That's why we're presenting this special *Flotsam* edition of the best anti-*Ahoy!* vituperative from around the country. But whether you like us or loathe us, write us–at *Flotsam,* c/o *Ahoy!,* Ion International Inc., 45 West 34th Street–Suite 407, New York, NY 10001.

Thank you for the lovely form letter informing me that all three of my programs were rejected.

The part that floors me is that they weren't rejected because they were bad, but because "other programs like them" (namely, *Solitaire*) have appeared in *Ahoy!*

This imbecilic reason is, frankly, a crock of *s---!* Glancing through back issues, I noted the following:

In the 10/84 issue, Dale Rupert explained joystick usage, along with program examples; several months later (4/85), Orson Card also had a joystick article with program examples: this isn't repetition? The 8/85 issue has *two* articles (in the *same* issue yet) about sound effects: this isn't repetition?

If this is the case, you ad requesting user-written programs should list the kinds of programs you *don't* want (e.g., card games)–this'll save you time in rejecting 'em, plus save your readers a lot of unnecessary programming –they won't write the damn things in the first place! (By the same "logic," I assume there won't be any more "outer-space programs published, right?)

Also, whoever rejected 'em is missing the point–they're *not* primarily card games: *Poker* is a slot machine simulation and *Match'em* is an artificial intelligence program (neither concept –to my knowledge–has been used in *Ahoy!*). Plus the fact that the infamous *Solitaire* program appeared in the October issue; if any of these were to appear in the February issue (at the earliest), that's a gap of *five* months!

In your quest for "different" programs, you'll be missing out on a lot of good programs. I've ordered several program disks in the past and am amazed that you would publish an idiotic asterisk moving through a maze *(Superhero),* while rejecting *Poker.* I'm extremely proud of my programs and feel that they're *at least* as good as anything I've yet seen.

By the rejecting of my programs, I now assume that I have the right to submit them to other magazines (which I fully intend to do); magazines that know a good program when they see one and are not bound by the "same-ness" rules that *Ahoy!* so obviously is. (I still don't get it: *Poker* is like *Solitaire* as *Space Invaders* is like *Asteroids*–they deal with the same subject, but are 'worlds' apart.)

Match'em isn't the only thing that uses artificial intelligence; *Ahoy!* has the monopoly on *that!*

–Norm Vogel
S. Bound Brook, NJ

We've heard about people who can't deal with rejection, Mr. Vogel. You wouldn't happen to be one of them?

I found the cartoon on page 117 of the December, 1985 issue of your magazine offensive. Moreover, such cartoons are simply inappropriate for a magazine designed to support family involvement in hobbyist computing.

I question your editorial judgement not from some lofty moralistic perch but from the sounder and more easily defined foundation of fiscal responsibility. Did you really believe that the cartoon would increase the circulation of your publication? I find that hard to believe. Nip this in the bud. Let's have no more of this nonsense.

To help you put this letter into its proper perspective I offer the following demographic information: I am a 42 year-old white Anglo Saxon with no religious affiliation who lives in a suburban population center of less than 5,000 persons. I am married with two children, a dog and a station wagon, and I earn in excess of $50,000 per year.

You are, my friend, in trouble when you begin to offend such as me.

–John S. Yarbrough
Glen Rock, PA

Responding to our Scuttlebutt *item scolding Smoky Mountain Software for requiring owners of* Grade Manager III *to pay $2.00 to correct the bugs in the program, Robert A. West of Smoky Mountain wrote:*

I have just received the enclosed copy of the item you published on us in your January issue (page 12).

It is interesting that you did not run our announcement of the release of *Grade Manager III,* nor did you choose to review the evaluation copy we sent. I can understand that. We're not one of your big advertisers. But, in all fairness, I believe you should have been consistent and omitted this cleverly distorted negative report as well.

The current version contains several enhancements. True, it does also correct three or four obscure logic errors which many users will never encounter. In fact, a good number of users are happy with the version they have and have chosen not to update. And, we're getting letters of appreciation for the support we're giving from those who do send in their disks with two dollars. A few have sent five or ten dollars "for the cause" when we only asked for two. Two dollars, on the average, doesn't pay for the shipping container, disks (many are damaged and must be replaced), and postage (especially when they send their binder and manual and that must be returned as well). Let me assure you there is none left over for labor.

Your cute reference to General Motors is inappropriate. You *do* indeed have to pay "shipping" on your car– both ways. In other words, you have to pay the costs of driving it to a dealer to get it "updated" and then pay the costs of driving it home from there. Try asking them to reimburse your gasoline or mileage. Our customers are welcome to bring their disks to our place to be updated *at no charge* (just like at General Motors), and some of them have.

Our industry will continue to have trouble surviving, and magazines like yours will continue to disappear, if you and others are not committed to fairness and responsible reporting. Otherwise, you not only hurt us, but also customers who might benefit from our software and magazines (such as *Ahoy!*) who might benefit from our advertising.

We feel that your magazine has done both us and your readers an injustice.

–Robert A. West, President
Smoky Mountain Software
Brevard, NC

Guess we'll catch the next Greyhound to North Carolina to get our disk updated.

COMMODORE ROOTS

CHARACTER DEVELOPMENT

Customizing Your Commodore

By Mark Andrews

Your Commodore 64 has a terrific built-in character set. From the C-64 keyboard, you can access more than 500 text and graphics characters. There are 512 characters in all, including upper case, lower case, reverse-video, and special characters, and one of the finest sets of keyboard-addressable graphics characters in the microcomputer industry.

But sooner or later, if you're like most assembly language programmers, you'll want to design characters of your own. Maybe just a few special characters, or maybe a whole new character set. You may even want to design a set of giant characters for use on title screens.

You can do all these things—and more—if you know how to alter your Commodore's built-in character set. It really isn't very difficult if you know a few tricks often used by professional Commodore 64 assembly language programmers.

'ROM-IMAGE' CHARACTERS

As you remember from last month, the 64 creates its screen display with the help of a sophisticated graphics chip called the VIC-II. The VIC-II generates the characters which it displays on the screen with the help of 4K of character data stored in hexadecimal addresses $D000 through $DFFF. (If you don't understand hexadecimal numbers, you can learn all about them by reading my book, *Commodore 64/128 Assembly Language Programming,* published earlier this year by Howard W. Sams.) But because of some fancy programming footwork used in the design of the C-64, the VIC-II chip never finds the character data which it needs by looking for it in the block of memory in which it is actually stored. Instead, like a man pursuing a mirage, the VIC chip always hunts for the character data in a different place from where the data is actually stored. And if you think *that's* strange, get this: the VIC-II actually *finds* the data that it's searching for—or something close enough to it, anyway—by looking in the wrong location!

Here's how all this works: although the C-64 stores its character data in ROM addresses $D000 through $DFFF, the VIC-II chip has been programmed to look for the data in two completely different blocks of memory known as "ROM image" locations. One of these phantom memory blocks is known as Bank 0, the other as Bank 2. The default address of Bank 0—the address that's used unless other instructions are given in a program—is the block of memory that extends from $1000 through $2000. The default address of Bank 2 is the segment of memory that extends from memory registers $9000 through $A000. These addresses can be changed, if desired, with the help of the VIC-II Memory Control Register, or VMCSB. Detailed instructions for programming this register, and a list of the addresses of all 21 of the memory blocks it can control, can be found in Chapter 10 of my book (mentioned above).

Once you know how to program the VMCSB chip, and how to tell the VIC-II chip exactly where to look for character data, it's easy to alter the Commodore 64's built-in character set, then use it in its altered form. Just follow these three steps:

HOW TO CUSTOMIZE A CHARACTER SET

1. Copy your computer's built-in character data from ROM into RAM.
2. Modify the character set that now resides in RAM in any way you wish.
3. Tell your computer's VIC-II chip where the modified set is, so that it can retrieve character data from that character set instead of from the "ROM-image" character sets at $1000 (in Bank 0) or $9000 (in Bank 2).

ONE SMALL PROBLEM

Once you know how the system works, all this talk about "ROM-image" characters loses much of its mystery. The concept of ROM-image memory was used in the design of the C-64 because the block of memory extending from $D000 through $DFFF has two different functions. This block of ROM is used not only by the C-64's VIC-II graphics chip, but also by the computer's input/output (I/O) drivers. Sixty times each second, during a brief interval known as a screen-refresh cycle, the VIC-II chip needs access to the character data in $D000 through $DFFF so that it can create a screen display. So, during that one-sixtieth of a second, addresses $D000 through $DFFF are used to hold the character-generator data needed by the VIC processor. But as soon as the VIC-II has completed its screen-refreshing operation,

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the character data required to create a screen display is bank-switched out of this memory block, and a set of registers which the Commodore 64 needs for the operation of I/O devices is switched in. During this period, which is most of the time, the C-64 operating system keeps itself busy taking care of certain important I/O chores. But 60 times each second, character data is switched back into the $D000-$DFFF block so the VIC-II chip can generate another screen display.

Precision timing is very important in these split-second bank-switching operations. If the timing were not super-accurate, some serious problems could arise. For example, if the character data in $D000 through $DFFF were switched off during a screen-refresh cycle, there would be no way of creating a screen display. And I/O operations could be fouled up if the VIC-II chip held onto its character data too long.

AN EASY SOLUTION

Fortunately, the designers of your 64 took precautions to prevent these kinds of disasters from happening. As experienced Commodore programmers know, a memory register in the 64 – register $0001, often called the R6510 register – can be used to determine at any given instant whether character data or I/O data will be switched into ROM at addresses $D000 through $DFFF. If Bit 2 of the R6510 register is set, I/O data will be stored in registers $D000 through $DFFF. If Bit 2 of the R6510 register is clear, the $D000-$DFFF memory block will hold character-generator data.

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Another memory register – the C2DDRA register, at memory address $DD02 – is often used in conjunction with the R6510 register. The C2DDRA is a "data-direction" register used to determine the direction of data flow to and from I/O devices. If Bits 0 and 1 of the C2DDRA register are set, any data that appears on lines going to peripheral devices will be regarded as output data, not input data. And that's the way things should be during a character-copying operation; otherwise, data generated by an I/O device might be accepted as input data, and might interfere with the RAM-copying process.

As an additional safety measure, the keyboard of the C-64 can be turned off while a character set is being copied into RAM. You can turn it off by storing the value $FE (binary 1111 1110) into Register CIACRE (VIC-II Control Register A), at Memory Address $DC0E.

MOVECHRS, published last month, is a short assembly language program that will copy all 512 characters of the Commodore 64 character set from ROM into RAM. It doesn't alter any of the characters; it just copies them, and tells the VIC-II chip where to find them. Examine the program (found on page 104 of last month's issue), and you'll see that it does everything explained so far in this chapter, and then some.

First the program makes sure that all I/O lines are designated as outputs. Then it makes sure that the C-64 will be left in its upper case mode when the copying operation is complete. Next, a sufficient amount of free RAM is set aside to hold the copied character set (only if the characters being copied will be used by a BASIC program). The C-64 keyboard is then turned off, and character ROM is switched into memory addresses $D000 through $DFFF.

After all that is done, the C-64 character set is copied into RAM using a standard block-move algorithm. Then I/O is switched back in, the keyboard is turned back on, and the VIC chip is told (via the VMCSB register) where its character-generator data can now be found.

MODIFYING A CHARACTER

Once a character set has been copied from ROM to RAM, any character that it contains can be modified in any way desired. MYCHRS (see page 98), an expanded version of MOVECHRS, demonstrates how a character can be altered once it has been moved into RAM. It makes use of a short and simple data-moving routine to turn the letter Z into a man waving his arms. Type the program, assemble it, and run it; then start typing on your keyboard. Every Z that you type will show up on your screen not as a Z, but as a little man.

MIXING TEXT AND HIGH-RESOLUTION GRAPHICS

Once you've copied a character set into RAM, you can do some very interesting things. For example, you can mix text characters and high-resolution pictures on the same high-resolution screen. SHOWCHRS on page 98 is a program that does just that: copies a character set into RAM, then employs a bit-mapping routine to print a character from that set on a high-resolution screen.

Type and run the SHOWCHRS program, and you'll see how it works. First it copies a character set from ROM to RAM. Then it sets up a high-resolution screen. Finally, it uses a bit-mapping algorithm to plot one character—specifically, an "A"—onto a high-resolution screen. The plotting algorithm is the same one that was used in two programs—BLACKBOARD and SKETCHER—presented in recent *Roots* columns.

One new routine in the SHOWCHRS program is found in Lines 225 through 246. This routine calculates the starting address of the data needed to form a character by going through a series of mathematical operations. The routine takes the character's ASCII code, multiplies it by eight (since it takes eight bytes to draw a character), and adds the result of this calculation to the starting address of a character set that has been copied into ROM. The final result is the starting address of the RAM data needed to generate the character.

Another new routine is the one that extends from Line 367 to 440. This segment of the program uses a nested loop to define the shape of a character, employing the same kind of plotting subroutine that was used in last month's column to draw a character on a bit-mapped screen.

Still another portion of the program worth looking at closely is a series of stack-manipulation instructions in Lines 404 through 416. These instructions are used to save the contents of the 6510 chip's X and Y registers on the stack while dots are being plotted on the screen. The contents of the X and Y registers have to be saved while the plotting subroutine is in use because both the shape-defining and dot-plotting routines in the SHOWCHRS program make use of these registers. So the contents of the registers have to be saved each time a dot-plotting routine is called, then restored each time a dot-plotting routine is completed.

HEADLINE CHARACTERS—THE EASY WAY

If you've ever wanted to mix text and high-resolution graphics on the same screen, you can see how a program like SHOWCHRS might someday come in handy. And in next month's column, we'll make the program downright spectacular. With a few minor changes, we'll expand it so that it will print a full line of headline-size characters—twice as wide and twice as high as ordinary text characters—on a high-resolution screen. Then we'll use an animated sprite—programmed in assembly language, of course—to add some action to the scene. ☐

SEE PROGRAM LISTINGS ON PAGE 98

Every program in this issue of *Ahoy!* is available on disk or cassette. See page 53 for details.

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COMMODARES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #27-1: LEFT OVERS

This problem was submitted by Ted Grondski (Springfield, MA). How many numbers up to one million meet these nine criteria:

When divided by 10, leaves a remainder of 9.
When divided by 9, leaves a remainder of 8.
...
When divided by 3, leaves a remainder of 2.
When divided by 2, leaves a remainder of 1.

PROBLEM #27-2: SOUND CHALLENGE

Wallace Leeker (Lemay, MO) correctly pointed out that we have not had any sound-oriented challenges. Here's the first. Create the most interesting or useful sound effect using the minimum number of instructions. That leaves it wide open. Describe your sound if possible.

PROBLEM #27-3: DOUBLE WEDGE

Tony Ruperto (Kitimat, BC) sent this variation of *Edge Wedge.* The user enters a sentence. The computer displays the two middle characters on the first screen line, the four middle characters on the second screen line, and so forth, until the entire sentence is printed on the bottom line. For example, if the user inputs "Commodares," the result on the screen is

```
    od
   moda
  mmodar
 ommodare
Commodares
```

PROBLEM #27-4: TOKEN LISTER

Jim Speers (Niles, MI) suggested this challenge. Write the shortest BASIC program which displays the numerical tokens for all BASIC keywords. Jim's solution uses a self-modifying program which requires the user to press the RETURN key for the next token to be displayed.

This month we will look at reader's solutions to *Commodares* from November 1985 issue. *Problem #23-1: Edge Wedge* brought numerous responses and variations. The problem was originally proposed by Charles Grady (Cleveland, TN). The problem is to display an input message in a wedge shape on the screen or a printer. The program below is a composite of solutions from four readers, James E. Killman (Memphis, TN), Russell K. Prater (Parker, FL), Robert R. Donlon (Cohoes, NY), and John K. Lunde (Orono, ME). They are representative of the majority of solutions for this problem.

```
10 REM  PROBLEM #23-1 :
20 REM    EDGE WEDGE
30 REM
97 REM
98 REM  SOLUTION BY JAMES E. KILLMAN
99 REM
100 INPUT"ENTER STRING #1";S$
110 L=LEN(S$)
120 FOR J=1 TO L:POKE 214,PEEK(214)-1
130 PRINT TAB(40-LEN(RIGHT$(S$,J)))RIGHT
$(S$,J)
140 NEXT
197 REM
198 REM  SOLUTION BY RUSSELL K. PRATER
199 REM
200 INPUT"OUTPUT TO 1 SCREEN OR 2 PRINTE
R   1[3"[LEFT]"]";P$
210 D=VAL(P$)+2:IFD<>3THENIFD<>4GOTO200
220 INPUT"ENTER STRING #2";S$:OPEN4,D
230 W=40 : IFD=4 THEN W=80
240 FORJ=1 TO LEN(S$)
250 PRINT#4,SPC(W-J)RIGHT$(S$,J);
260 NEXT : PRINT#4 : CLOSE4
297 REM
298 REM  SOLUTION BY ROBERT R. DONLON
```

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```
299 REM
300 INPUT"STRING #3";S$ : L=LEN(S$)
310 FOR X=0TOL-1:B$=MID$(S$,L-X,L)
320 PRINT SPC(39-X);B$;
330 NEXT
397 REM
398 REM  SOLUTION BY JOHN K. LUNDE
399 REM
400 INPUT"PRINTER/SCREEN (P/S)";P$:ON-(P
$<>"P"ANDP$<>"S")GOTO 400
410 INPUT"STRING #4";S$ : IF P$="P"THEN
OPEN4,4:CMD4
420 L=LEN(S$):FORX=1TOL:Z$=Z$+" ":NEXT
430 FOR X=0TOL-1:PRINT RIGHT$(Z$+MID$(S$
,L-X),L):NEXT
440 GET X : SYS62255 :REM   CLOSE ALL
```

Compare the use of SPC versus TAB and RIGHT$ versus MID$. In line 230, Russell specifies the width of the device. You may change it to 22 for the VIC 20. John's solution ends with a SYS call to address 62255, which he says is a handy way to close any open files on the C-64 without actually specifying them. James POKEs into address 214 to keep lines from being skipped on the screen. The POKEs are ignored by the printer.

We had solutions to this problem from a nine-year-old, Billy Soudan (Girard, PA), as well as from a grandmother, Doreen Saffeels (Lakebay, WA). Other readers with solutions only to this problem include Paul A. Sisul—a COMAL solution (St. Louis, MO), Tony Ruperto (Kitimat, BC), Bob Wilkinson, Michael J. Rocco (West Mifflin, PA), Tom Frankson (Bolingbrook, IL), Brian Wilcox (Coldwater, OH), Marvin Segal (Springfield, NJ), Peter Lam (Langenburg, SK), Peter Troy (Casco, ME), a reader from Bushnell, FL whose name was probably on the discarded envelope, Rick MacDonald, J.R. Tomasello (Crosby, TX), Stephen Lutz (Loring AFB, ME), Arnie Friedman, Robert Fisher (Cutchogue, NY), and Henry Brown (Brooklyn, NY).

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Reader Service No. 255

Problem #23-2: Rooting Routine, which was suggested by Alan Flippin (San Jose, CA) also brought many solutions. Without using any "fancy" functions, the program calculates to the nearest integer the square root of any whole number from 1 to 65535. The two most common approaches might be described as the "look-up table method" and the "Newton-Raphson method."

The solution below from Dick Eigenraam (Oak Harbor, WA) represents the look-up table solution.

```
10 REM  PROBLEM #23-2 :
20 REM    ROOTING ROUTINE
30 REM  SOLUTION BY DICK EIGENRAAM
40 REM
50 INPUT N : G=1
60 IF G*G<N THEN G=G+1 : GOTO 60
70 G=G-1 : IF (G+.5)*(G+.5)<N THEN G=G+1
80 PRINT G
```

The program steps through the squares of each successive integer until a square is found which is larger than or equal to the input number. Line 70 determines whether the current "guess" value or the integer one less than it is closer to the right answer. This is a straightforward way to found the result to the nearest integer, which is then printed in line 80. Dick suggested adding line 15 IF N > 1E6 THEN G=1000 to speed things up for large values.

The other approach is based upon a standard procedure described in books on numerical analysis, called Newton's method of the Newton-Raphson method for determining roots of an equation. If the equation is written as X 2=D, the problem is to find the value of X for a given value of D. In other words, find the square root of D which is X.

The procedure as described by Thomson Fung (San Diego, CA) is to repeatedly replace X with the quantity .5*(X+D/X). This is called a recurrence relation. The value of X eventually converges to the desired solution.

```
10 REM  PROBLEM #23-2 :
20 REM    ROOTING ROUTINE
30 REM  SOLUTION BY THOMSON FUNG
40 REM
50 PRINT"TO EXIT, TYPE A # < 1"
60 INPUT"ENTER A # FROM 1 TO 65535";D
70 IF D<0 THEN END
80 X=100 : REM ANY INITIAL VALUE > 0
```

```
90 FOR I=1 TO 10
100 X=.5*(X+D/X)
110 NEXT I
120 PRINT"SQUARE ROOT OF"D"="INT(X+.5)
130 PRINT : PRINT : GOTO 50
```

You might modify this program to display the intermediate values of X. Rather than use a fixed number of iterations (10 in this program), you might compare each new X value with the previous X value to determine when enough accuracy has been reached.

Solutions to this problem were also received from Wallace Leeker (Lemay, MO), John Prager (Bay City, MI), Philip Nimmo (Fenton, MI), Dennis McGrath (Cicero, IL), Matt Shapiro (Ft. Lee, NJ), Dino Russo (Eglin AFB, FL), James Borden (Carlisle, PA), Jim Speers (Niles, MI), Jim McClain (APO NY), Frank Smith (Wilmington, DE), Norm Green (Perth, ONT), Bill Hoyt (Battle Creek, MI), Alan Flippin (San Jose, CA), Joseph Sacco (North Bergen, NJ), Charles Grady (Cleveland, TN), and Robert Hsueh (Flushing, NY).

When James Borden (Carlisle, PA) originally posed *Problem #23-3: Speedy Bug,* he suggested that the bug can fly at 125 mi/hr. Despite the fact that I didn't mention the speed of the original bug, many readers took the omission in stride and simply chose a value or wrote a program which allowed the user to enter a value. A few readers were less ambitious and, without offering a solution, merely chastised me for my bug in the statement of the problem. (Naturally I won't mention their names.)

The solution is easily calculated. Train A is traveling at 100 mi/hr with respect to Train B. Since they were initially 800 miles apart, they collide in 8 hours. The bug flies for 8 hours at whatever speed is specified. At 125 mi/hr, it travels 1000 miles before its demise. That, however, was NOT the way to solve the *Commodare.* The desired approach was a computer simulation of the problem, not merely the evaluation of the formula BUG DISTANCE = BUG SPEED x 8 HOURS.

A few readers pointed out that the bug's speed must be greater than that of Train A from which it started (or else Train A would run into it immediately). The only solution that attempted any animation was submitted by Jim Speers (Niles, MI). Jim's solution shows the relative positions of the trains and the bug every time the bug reaches one of the trains. The various parameters are displayed along with the graphics display. Jim's program is too long to list here, but if you want a printout of the listing, send a self-addressed, stamped envelope with your request clearly stated to *Commodares* at the address given at the start of this article.

Award for the most compact solution goes to Phil Nimmo (Fenton, MI). Phil's one-liner is expanded into two lines for clarity and ease of editing below.

```
1 REM  PROBLEM #23-3 :
2 REM    SPEEDY BUG
3 REM  SOLUTION BY PHIL NIMMO
4 REM
5 Y=800:FORT=1TOY:C=C+1-W:W=2*((W>0)OR(C
>Y))*(C>X)
6 Y=Y-3/8:X=X+5/8:B=B+1:PRINTC;:NEXT:PRI
NTB
```

Phil explains that X is train A's position, Y is train B's position, C is the position of the bug, B is the total distance traveled by the bug, and W has a value of zero if the bug is moving toward train A and a value of twice the bug's speed if the bug is going toward train B. He assumed the bug's speed is 100 mi/hr and he updates the bug's position every 1/100 hour. In that time the trains move .625 mi and .375 mi which is shown as 5/8 and 3/8 to conserve keystrokes. Once the trains collide at the 500 mile mark, the total distance traveled by the bug (800 mi) is displayed.

The bug's speed can be changed to 200 mi/hr by replacing the ones with twos in the C and B equations, and changing the 2 (twice the bug speed) to 4 in the W equation. Now there are more reversals, and the same final position, but the bug travels twice the total distance.

A more conventional solution which is also more flexible is listed below from David Hoffner (Brooklyn, NY).

```
1 REM  PROBLEM #23-3 :
2 REM    SPEEDY BUG
3 REM  SOLUTION BY DAVID HOFFNER
4 REM
```

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Reader Service No. 256

```
10 SA=62.5:SB=37.5:D=800:INPUT"SPEED OF
BUG";SF:IFSF<63THEN10
20 PRINT"NO. OF      --POSITION OF---     M
ILES
30 PRINT" HOURS      TRAIN A  TRAIN B     F
LOWN
40 A=SB:GOSUB50:A=SA:GOSUB50:GOTO40
50 T=D/(SF+A):TT=TT+T:H=.01+(INT(TT*100)
/100):D=D-T*(SA+SB):IFD<.01THENEND
60 PA=TT*62.5:PB=800-TT*37.5:PF=-PB*(A=S
B)-PA*(A=SA):MF=MF+ABS(PF-SP):SP=PF
70 PRINTH,INT(PA+.5),INT(PB+.5),INT(MF+.
5):RETURN
```

The initial parameters are given in line 10 and may easily be changed. The display shows the bug's progress at each reversal.

Other solutions which simulated the bug's flight were received from James Borden and from Matt Shapiro (Ft. Lee, NJ).

There were some energetic efforts on *Problem #23-4: Typing Tutor.* Two different approaches are represented by these programs from Gary Hudach (Youngstown, OH) and from John Prager (Bay City, MI).

```
1 REM  PROBLEM #23-4 :
2 REM     TYPING TUTOR
3 REM  SOLUTION BY JOHN PRAGER
4 REM
100 FOR J=0 TO RND(0)*5:READ S$:NEXT
110 EP=0:L=LEN(S$):PRINT S$:PRINT:T0=TI
120 FOR J=1 TO L:A$=MID$(S$,J,1)
130 WAIT 198,15:GET U$:IF U$<>A$ THEN EP
=EP+1:GOTO 130
140 PRINT U$;:NEXT:T1=TI
150 PRINT:PRINT"ERRORS..."EP:PRINT "TIME
...."T1-T0
200 DATA "ALAS! THISTLES BRISTLE IN MY B
USTLE!"
210 DATA "WAFTING ZEPHYRS QUICKLY VEX JU
MBO."
220 DATA "HUMBLE BUMBLEBEES MUMBLE HUNGR
ILY."
230 DATA "57% OF ALL PEOPLE INVEST $2.78
 WEEKLY."
240 DATA "FOR J=0 TO 255:POKE 53281,J:NE
XT J"
```

```
10 REM  PROBLEM #23-4 :
20 REM     TYPING TUTOR
30 REM  SOLUTION BY GARY HUDACH
40 REM
50 S$="THE OLD GREY FOX IS SLY AND QUICK
":TI$="000000":PRINTS$:FORX=1TOLEN(S$)
60 GETC$:IFC$=""THEN60
70 IF C$<>MID$(S$,X,1)THENM=M+1
80 PRINTCHR$(18);CHR$(145)SPC(X-1)C$:PRI
NTCHR$(145):NEXT:PRINTM;TI
```

You should be able to modify either of these programs to give you some quick practice on those cumbersome keystroke sequences. Lengthier but very nice solutions were also sent by Jim Speers, Wallace Leeker, Jeff Lambert, Andy Bzostek, Ron Weiner, Bill Hoyt, Matt Shapiro, and Jim Borden.

Alan Flippin mentioned that his program listed in the November *Commodares* should have contained a PRINT "[CLEAR]" in line 400. My apologies for the omission.

Many responses regarding the crisscrossed FOR-NEXT loops mentioned in the November *Commodares* implied that there was really nothing wrong with one FOR-NEXT loop jumping into the midst of another as long as it jumped back out again. Evidently the un-nested FOR-NEXT loops work correctly on the Apple IIe as well as the Commodore Super PET. I will just reiterate my original observation that in all the other versions of BASIC I have used except for Commodore BASIC, overlapping FOR-NEXT boundaries are strictly verboten. Good programming practice would not condone such branching anyway.

Keep those challenges coming. Every month, someone complains that there are too many math-oriented problems while someone else suggests that more emphasis be placed on the "useful" problems, such as the *Rooting Routine* problem. We use the best of your suggestions, so if you prefer more of some problems than others, send some examples. Good luck on this month's challenges. ☐

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CADET'S COLUMN

COPYING AND ORGANIZING SOFTWARE

By Cheryl Peterson

Many legal questions arise when software licensing and copying is discussed. One question is whether or not the software purchaser has the right to make a backup copy for his own use. Most responsible software buyers will readily admit that creating a copy and giving it to a friend is not a legal use of the software.

As of this writing, no one has proved that "shrink-wrap licenses" are legal. These are licenses which state emphatically that the user is not allowed to create copies of the program disk. The copyright laws of the US are generally being used as the standard for measuring legal use of software, since most commercially offered software contains a copyright notice.

According to copyright law, when you buy a program (or book or magazine or videotape or record album) you are entitled to create one backup copy to use if the original becomes damaged or destroyed. Reasonable people can see the wisdom in this policy. No one should have to pay twice for a product that is designed to be reused many times. (Contrary to popular belief, many software marketers are reasonable people.)

Why then do companies put copy protection on their disks? Piracy, plain and simple. The software companies feel they must protect their product from theft. The copyright law doesn't say that a manufacturer has to make it easy for you to copy the product. Nor does it say he must provide you with a backup copy. More and more, software companies are agreeing to provide a backup copy in exchange for a few dollars and a signed license agreement which basically says that you won't give away their software. But not all software vendors have made this decision, so copy programs are a necessity.

Why? Because people and disk drives can make mistakes. Forgetting to swap out a disk can write something on it that will destroy vital information, causing the program to fail. (You'd be surprised how many software vendors send out software without a write protect tab on the disk. Then again, maybe you wouldn't.) A power glitch can corrupt a program disk. Stray magnetic sources can scramble disks as well. Last, but certainly not least, disks are not perfect. They are not made to last a lifetime (no matter what the warranty says). The bonder that joins the oxide to the plastic does wear out eventually, and software manufacturers are not known for using Dysan disks.

I had originally intended to do indepth reviews of several well-known copy programs with this article, but by the time I'd collected enough of them, Morton Kevelson beat me to the punch. So rather than repeat his efforts, I'll refer you to his reviews of *FAST HACK'EM* and *Isepic* in the October '85 *Ahoy!* I'll give capsulated info on *Copy II 64, Mr. Nibble, Ultrabyte Disk Nibbler, SuperClone with Unguard, Isepic,* and *FAST HACK'EM.*

TYPES OF COPY PROGRAMS

Various public domain programs contain both file and disk copy programs. For the most part, these will do for copying other public domain or unprotected programs. The DOS Wedge distributed by Commodore with the 1541 disk drives will also make simple copies. The *Fast Load* cartridge by Epyx also contains a good copy utility for non-protected software.

There are two types of commercially marketed copy

COPY PROGRAMS

Apallo
MegaSoft Limited
P.O. Box 1080
Battle Ground, WA 98604
(206) 687-5116
$29.95 + $2 shipping and handling

Copy II 64
Central Point Software
9700 SW Capital Hwy. #100
Portland, OR 97219
(503) 244-5782
$39.95 + $3 shipping and handling

Disk Copy
15340 W. Dixie Highway
N. Miami, FL 33162
(305) 949-8440
(800) 327-8456 ext. 5
$29.95 + $2 shipping and handling

FASTHACK'EM
Basement Boys Software
P.O. Box 30901
Portland, OR 97230-0901
(503) 256-5506
$29.95 + $3 shipping and handling

Mr. Nibble
Full Circle Software
P.O. Box 1373
Dayton, OH 45401
(513) 223-2102
$49.95

Mirror—Disk Copier
Compumed
P.O. Box 6427
Salinas, CA 93912
(408) 758-2436
$24.95 + $3 shipping and handling

Diskmimic 5+
AID Corp.
4030 Hempstead Turnpike
Bethpage, NY 11714
$49.95 + 1.50 shipping and handling

Ultrabyte Disk Nibbler
P.O. Box 789
La Canada, CA 91011
(818) 796-0576
$39.95 + $4 shipping and handling

programs: easy-to-use, menu-driven, "brute force" copiers designed for those who don't want to learn the ins and outs of copy protection and highly involved, technically oriented copy programs designed to allow the user to "break" the copy protection as well as copy the disk. Depending on how much of a techie you are, one or the other will suit you.

The important consideration here is what kind of copies you want. The brute force copiers will copy many (if not all) of the commercially marketed software programs. These copies will be identical to the originals and should perform just as your master copies do. This means that the copies will load at the same speed, bang the head of your drive around, disable cartridge resident programs like *Fast Load*, and be uncopyable with regular copy programs.

The breaking copiers include utility routines to analyze the disk and disable the copy protection so that copies can be made with any copy program. These copy programs frequently come with a newsletter and helpful instructions for disabling the copy protection on many commercially offered programs.

CHOOSING A COPY PROGRAM

Before running out to buy a disk copy system you need to decide exactly what you want to do with it. Do you need to be able to copy programs with very sophisticated copy protection schemes? Are most of your programs already marketed with backup copies available for reasonable prices? Do you have one particular program that you use intensively that absolutely must be available to you at all times? Is it worth the extra effort for you to learn to "break" the copy protection schemes and create faster loading and "gentler" copies? All these questions, along with the list price, should be considered.

In addition, you should note the support the upgrade policies of the companies. A copy program is one piece of software that really requires support. As copy protection schemes get more complicated, copy programs must get more complicated. Will your software manufacturer be issuing upgraded versions as needed? How much will the upgrades cost? Do they have a newsletter or other support network to help you with new programs coming on the market? Again, you should look at your own needs to decide how much software you want to buy.

It's a good idea to spend some time with a local dealer. Though it may not seem to be in their interest, most dealers do market copy programs, and can give a good idea of which companies provide the best support.

Several of the programs I examined promised user support and/or upgrade information in return for a product registration card.

Copy II 64–support, product improvements, and updates.

Isepic–support.

Ultrabyte–support by mail.

Mr. Nibble–updates.

Super Clone–update information, newsletter.

INTERESTING NOTION

So how do these companies view copyright laws and making copies of their software?

Copy II 64–Not copy protected. Package includes information about copyright and licensing agreements. Specifically prohibits use of the program for illegal purposes and includes copy of "Thou Shalt Not Dupe," a pamphlet provided by ADAPSO that discourages software piracy.

SuperClone with Unguard–Not copy protected. Includes a warning stating that the programs are for creating archival disks only.

Disk Nibbler–Copy protected. Backup disks available for $20 plus $3 shipping and handling. Documentation indicates software is for legal use only. Will not back up itself, or several other copy programs including *Mr. Nibble, Ultracopy II, Disk Maker,* and *Di-Sector.*

Mr. Nibble–Copy protected backup copies may be purchased for $10. Specifically states for archival use only and that it is illegal to sell or distribute copyrighted software.

Isepic–Since a cartridge is included with the package it has no need of copy protection. Also prohibits illegal use, including the facilitation of software piracy.

FASTHACK'EM–Not copy protected. Though prohibition of illegally copying their software abounds, no mention made of other vendors' copyright.

FOR ADDITIONAL HELP...

The For Starters Special Interest Group on Viewtron has gone up. I hope that you will all feel at home there. As SYSOP, I want to help all our new users to get more out of their Commodore computers and Viewtron. My user number is 266399CCP, but a message addressed to "ALL" will still get my attention. I'll be spending a lot of time in our CB section, if you'd like some "real time" response. And I'd really appreciate it if you could mention somewhere that you read *Ahoy!* ☐

ERRATA

STREAMER FONT (Jan. '86)

On page 28 instructions are given to enter POKE46,25:POKE64000,0:NEW. That line should read POKE44,25:POKE6400,0:NEW.

AHOY! BABBLER (Jan. '86)

The positive polarity marks on the electrolytic capacitors (see page 42) should be connected as follows:

C10 to pin 2 of the user port
C3 to the junction of C2 and R2
C4 to pin 1 of U3
C7 to pin 5 of U3

On the parts list (page 40), C1,2 should be listed as .022mf and C3,10 as 22mf.

PROGRAMMER'S AID

For the C-64

By Jim Speers

Programmer's *Aid* is a collection of relatively brief BASIC subroutines that can be helpful in writing programs. The program is written as a single subroutine which can be appended to an existing program or loaded before starting to enter a program. The starting line number is 59999, which should not conflict with most existing programs.

Once loaded, entering RUN60000 or GOTO60000 in direct mode will result in the printing of a menu screen. This describes the subroutines, which can be activated directly from the menu screen. Subroutines can also be entered directly with RUN or GOTO statements in direct mode.

RUN60070 will enter a line-deletion subroutine. You will be asked for a low line number and a high line number. All lines between those two line numbers (including the line numbers entered) will be deleted.

RUN60060 will delete all lines in the program which begin with "REM" or with a colon. This feature can be used for quickly preparing remark-free programs, and also for debugging. It is often useful to enter PRINT, STOP, or other lines during debugging. If these are preceded by a colon, they will still function, but when finished they can all be removed with a single run of this subroutine.

RUN60040 will probably be less often used, but is occasionally helpful. It will print a listing of all line numbers in the program, showing the location in memory where each line begins.

Once your program is completed, this entire subroutine can be made to delete itself by following the directions on the menu screen. Because of this capability, it is wise to save a copy after typing it in, and before testing it.

Since this program runs entirely in BASIC, it does not have the speed of machine language. In tests on a 477-line program, it read through it for listing in about 30 seconds, deleted 109 REMARK lines in about 90 seconds, and deleted the remaining 368 lines (including itself) in slightly over 2 minutes.

For those who are interested in the techniques of the program, the two deletion subroutines use the dynamic keyboard technique for line deletion. Variables which would be destroyed by the editing are stored when necessary in zero-page or the cassette buffer, and later retrieved. ☐ *SEE PROGRAM LISTING ON PAGE 109*

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BANNER

For the C-64

By Curtis Kaylor

Banner allows you to print large letters sideways on your printer, creating signs of any length. Many banner programs use a character set defined by the program. This is dispensed with here in favor of the Commodore 64's built-in character set.

While *Banner* does not offer all the features of Bob Spirko's *Streamer Font* (January '85 *Ahoy!*), it does enjoy the advantage of being much shorter—just 18 lines. It will print all the characters on the Commodore keyboard: normal, reverse, graphics, upper case, and lower case. It will even print custom character sets. You can define the height and width of your letters, as well as the print character from which they are created.

As an added feature, this program also prints vertical banners: that is, the letters run down, centered on the page.

USING THE PROGRAM

Type in the program on page 108, save it, and run it. The screen clears and displays

PRINT CHARACTER? X

Pressing RETURN uses the shifted-V [X] as the print character; pressing any other key and RETURN uses the character entered as the print character.

The program then displays

HEIGHT (1-9)? 5

Enter the height of the characters (print columns divided by eight) and press RETURN, or just press RETURN for a height of five. The computer then displays

WIDTH? 5

or the height you selected. Enter the width of the characters and press RETURN, or just press RETURN for the width shown.

After the height and width have been entered, the computer asks

DOWN OR SIDEWAYS? (D/S)

Type 'S' if you want the banner to print sideways along the left side of the paper, or 'D' if you want the letters printed down the middle of the paper. Do not press RETURN after the 'D' or 'S'.

The screen once again clears and displays

MESSAGE?

It is at this point that you make your choice of upper case/graphics or upper/lower case. To print lower case letters, hit the COMMODORE and SHIFT keys simultaneously. Not only does this put the computer in upper/lower case mode, but it tells the program that you want the banner printed in upper/lower case. If you want to keep upper case/graphics mode, don't do anything.

Now that you've chosen the print character, the height and width of the message, whether to print the message down or sideways, and upper or lower case modes, you can proceed to the final step: printing your message.

Type your message and press RETURN. After a pause the computer will begin printing out your banner, if you have a printer attached, turned on, and paper inserted.

After the banner is printed you will be asked

ANOTHER BANNER (Y/N)?

Typing 'Y' starts the program over; typing anything else exits the program.

To mix upper case/graphics and upper/lower case modes or different sized characters, do the message one or more characters at a time.

CUSTOM CHARACTERS

To print custom characters with *Banner*, you must have your custom character set loaded and activated. Then load *Banner* and run it.

Note: if your custom character set replaces the standard alphabet, the program prompts may look garbled, but will operate as normal.

PROGRAM OPERATION

The program begins by printing the switch to upper case/graphics characters. It then INPUTs the print character, height, width, direction of print, and message.

Line 120 constructs the print pixel by building two strings, one of the print character, the other of spaces, with length equal to the requested height.

The program then checks to see where the current character set is displayed. This allows the program to print different character sets, including custom character sets.

After opening a channel to the printer, the program begins looping through the message string. Line 150 changes the characters from ASCII to the screen display equivalents.

The program then turns off the keyboard (to be able to look at character ROM), loads the character definition into an array, and turns the keyboard back on.

If vertical printing was selected, the program skips to the vertical print routine; otherwise it goes on to the horizontal print routine.

The program steps through the pixels of the character from left to right using the Y loop. The W loop determines the width of the pixel, and the Z loop cycles through the horizontal layers of the character.

After the character is printed, the program loops back to line 140 and does the next character, and so on until the message is finished. It then closes the channel to the printer, asks if the user wants to do another message, and RUNs again if he or she does. ☐

SEE PROGRAM LISTING ON PAGE 108

MAKER BILLBOARD MAKER BILLBOARD MAKER
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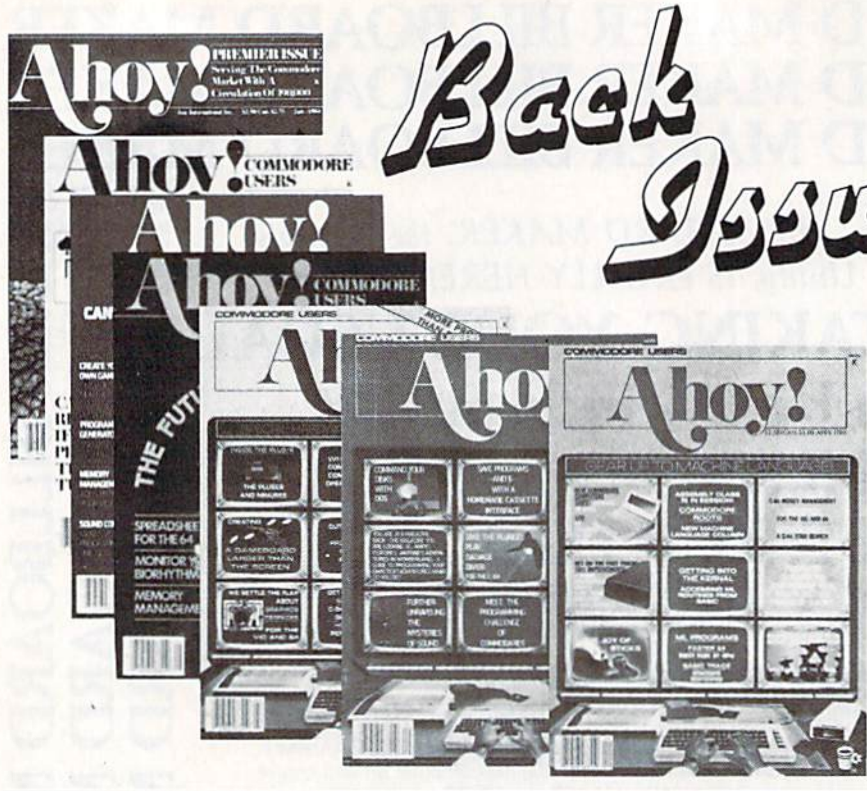

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Compiled by Michael R. Davila

Contributors to *Tips Ahoy!* receive up to $50 —and in some cases more—for hints, short routines, and suggestions that help their fellow *Ahoy!* readers get more out of their Commodore computers (or get the same old things out more easily). Send your original flashes of brilliance to *Tips Ahoy!*, c/o *Ahoy!* Magazine, Ion International Inc., 45 West 34th Street—Suite 407, New York, NY 10001. Programs should be sent on disk; a stamped and self-addressed envelope must be included.

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—Edward Horgan
Coatesville, PA

LETTER SPRITE

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—Ernest Barkman
Orlando, FL

```
10 COLOR 0,1:COLOR 4,1
20 GRAPHIC 1,1
30 CHAR,2,2,"A"
40 SSHAPE A$,11,10,34,31
50 SPRSAV A$,1
60 SPRITE 1,1,3,0,1,1,0
70 MOVSPR 1,240,70
80 MOVSPR 1,180#3
```

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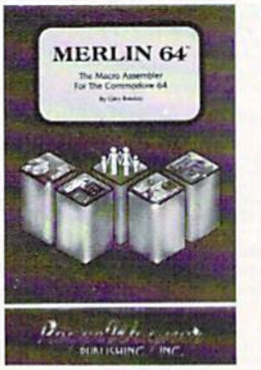
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Since *End Quote* is self-activating (you don't have to SYS it) and NEWS itself, be sure it's saved before you run it. If you want to to disable *End Quote*, press RUN STOP/RESTORE. SYS 700 will reenable it.

So the next time your screen is about to fill with undesirables, just press f7 and put away your fingerprint kit.

—Buck Childress
Salem, OR

```
1 REM *** END QUOTE *** BUCK CHILDRESS *
 BOX 13575 * SALEM, OR 97309 ***
2 PRINTCHR$(147):FORJ=700TO741:READA:POK
EJ,A:X=X+A:NEXTJ
3 IFX<>5163THENPRINT"ERROR IN DATA...":E
ND
4 SYS700:NEW
5 DATA173,143,2,174,144,2,141,240,2,142,
241,2
6 DATA120,169,213,162,2,141,143,2,142,14
4,2,88
7 DATA96,165,203,201,3,208,8,169,0,133,1
99,133
8 DATA212,133,216,108,240,2
```

RESTORE LN FOR THE C-64?

A useful command found in some BASICs, but unfortunately not in the 64's, is "RESTORE LN". This command allows setting the DATA pointers to any desired line number.

The typical C-64 approach is a READ loop that scans from the beginning for a key word or number, then proceeds from that point. In a program with a large DATA file, this can consume considerable time; after all, the essence of computing is speed.

The following ML utility (which is shown stored at locations 680-729 but can be placed anywhere in free RAM) permits such a function by a simple SYS call, "SYS680,EXPRESSION", where "EXPRESSION" can be any number, variable, or mathematical operation that represents a valid DATA line number, e.g.: SYS 680,INT (RND(1)*10)+10. Remember to save the program before you run it. Upon execution the program will erase itself. Also, if an invalid line number is called for, READ will begin at the next higher DATA line, or if beyond the last DATA line, will give an "OUT OF DATA" error.

—Bob Renaud
Pittsfield, MA

```
10 DATA 165,020,072,165,021,072
20 DATA 032,253,174,032,138,173
30 DATA 032,170,177,133,021,132
40 DATA 020,032,019,166,165,095
50 DATA 133,065,165,096,133,066
60 DATA 104,133,021,104,133,020
70 DATA 056,165,065,233,001,133
80 DATA 065,165,066,233,000,133
90 DATA 066,096
100 FORX=680TO729:READA:POKEX,A:NEXT:NEW
```

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ALL C-64

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**For best results an eight voice polyphonic instrument is recommended. QRS Music disks will also operate with the Passport MIDI Interfaces for the Commodore and Apple II + and Apple IIe.

Reader Service No. 266

PRINT USING TRICKS

One of the more welcome enhancements of the C-128's BASIC 7.0 is the PRINT USING statement. Although it was designed for formatting output, particularly numeric data, it can perform a variety of useful functions. There are four standard symbols associated with the PRINT USING statement: the space, the comma, the decimal point, and the dollar sign. For example, the statement PRINT USING "$####.##;123.225 would produce output "$ 123.23". The PUDEF command allows the programmer to redefine any of these symbols. The format for the command is PUDEF "XXXX", where each X is replaced with the substitute symbol in the order space, comma, decimal point, dollar sign. For example, PUDEF ",." would replace the "$" with the British pound sign. PUDEF "0,.$" would print leading zeroes in place of spaces so the statement PRINT USING "###";3 would print as "003".

The program below, which creates BASIC data statements from raw data in the sprite definition area, makes clever use of the PRINT USING and PUDEF commands. In this particular application, I redefined the space character as [RVS OFF] since it essentially has no effect and acts like a null character. The result is that instead of padding fields of less than three characters with spaces, the leading spaces are eliminated. The program also makes use of the "dynamic keyboard" technique. On the 128, the input buffer begins at address 842, and address 208 is set to the number of characters in the buffer.

To use the program, use the SPRDEF mode to create the sprites, then run the program. When asked for the sprites you desire statements for, just enter their numbers without any commas or other punctuation and press RETURN when done.

—Walt Fini
Panama City Beach, FL

```
10 REM AUTO DATA STATEMENT MAKER
20 INPUT"STARTING LINE NUMBER";L1
30 INPUT"LINE NUMBER INCREMENT";IC
40 INPUT"SPRITES DESIRED ---------[CBM Q]
[10"[LEFT]"]";S$:N=1:SN=VAL(LEFT$(S$,1))
50 PUDEF"[RVSOFF]"
60 S=DEC("0E00"):DO:PRINT"[CLEAR][DOWN][
DOWN]";:FOR SG=0TO3:PRINT USING"##### DA
TA ";L1+IC(SG+4*(SN-1));
70 FOR BY=0TO15:PRINT USING"###,";PEEK(S
+BY+16*SG+64*(SN-1));:NEXT:PRINT
80 POKE842,13:POKE843,13:POKE844,13:POKE
845,13:POKE846,13:POKE208,5:END
90 N=N+1:SN=VAL(MID$(S$,N,1)):LOOP UNTIL
SN=0:PRINT"[CLEAR]STATEMENTS COMPLETE":B
=RCLR(0):L=RCLR(5):COLOR5,B
100 PRINT:PRINT"DELETE 10-100":PRINT"[DO
WN][DOWN]COLOR 5,L":POKE842,13:POKE843,1
3:POKE208,2:PRINT"[HOME]";:END
```

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Reader Service No. 263

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart ♥ . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. ☐

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type	You Will See
[CLEAR]	Screen Clear	SHIFT CLR/HOME	♥
[HOME]	Home	CLR/HOME	S
[UP]	Cursor Up	SHIFT ↑CRSR↓	●
[DOWN]	Cursor Down	↑CRSR↓	Q
[LEFT]	Cursor Left	SHIFT ←CRSR→	▌
[RIGHT]	Cursor Right	←CRSR→	▐
[SS]	Shifted Space	SHIFT Space	■
[INSERT]	Insert	SHIFT INST/DEL	▌
[DEL]	Delete	INST/DEL	T
[RVSON]	Reverse On	CNTRL 9	R
[RVSOFF]	Reverse Off	CNTRL 0	▀
[UPARROW]	Up Arrow	↑	↑
[BACKARROW]	Back Arrow	←	←
[PI]	PI	π	π
[EP]	English Pound	£	£

When You See	It Means	You Type	You Will See
[BLACK]	Black	CNTRL 1	■
[WHITE]	White	CNTRL 2	E
[RED]	Red	CNTRL 3	£
[CYAN]	Cyan	CNTRL 4	◥
[PURPLE]	Purple	CNTRL 5	▨
[GREEN]	Green	CNTRL 6	↑
[BLUE]	Blue	CNTRL 7	←
[YELLOW]	Yellow	CNTRL 8	π
[F1]	Function 1	F1	■
[F2]	Function 2	SHIFT F1	■
[F3]	Function 3	F3	■
[F4]	Function 4	SHIFT F3	■
[F5]	Function 5	F5	■
[F6]	Function 6	SHIFT F5	■
[F7]	Function 7	F7	■
[F8]	Function 8	SHIFT F7	■

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** This page and page 113 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Read these pages **before** entering programs.

BUG REPELLENT

This program will let you debug any *Ahoy!* program. Follow instructions for VIC 20 (cassette or disk) or C-64.

VIC 20 VERSION

By Michael Kleinert and David Barron

For cassette: type in and save the *Bug Repellent* program, then type RUN 63000[RETURN]SYS 828[RETURN]. If you typed the program properly, it will generate a set of two-letter line codes that will match those listed to the right of the respective program lines.

Once you've got a working *Bug Repellent*, type in the program you wish to check. Save it and type the RUN and SYS commands listed above once again, then compare the line codes generated to those listed in the magazine. If you spot a discrepancy, a typing error exists in that line. Important: you must use exactly the same spacing as the program in the magazine. Due to memory limitations on the VIC, the VIC *Bug Repellent* will register an error if your spacing varies from what's printed.

You may type SYS 828 as many times as you wish, but if you use the cassette for anything, type RUN 63000 to restore the *Repellent*.

When your program has been disinfected you may delete all lines from 63000 on. (Be sure the program you type doesn't include lines above 63000!)

For disk: enter *Bug Repellent*, save it, and type RUN:NEW [RETURN]. Type in the program you wish to check, then SYS 828.

To pause the line codes listing, press SHIFT.

To send the list to the printer type OPEN 4,4:CMD 4:SYS 828[RETURN]. When the cursor comes back, type PRINT#4:CLOSE 4[RETURN].

```
•63000 FORX=828TO1023:READY:POKEX,Y:NEXT:END   AC
•63001 DATA169,0,133,63,133,64,165,43,133,251  JL
•63002 DATA165,44,133,252,160,0,132,254,32,228 DF
•63003 DATA3,234,177,251,208,3,76,208,3,230    OE
•63004 DATA251,208,2,230,252,169,244,160,3,32  OH
•63005 DATA30,203,160,0,177,251,170,230,251,20
 8                                             KO
•63006 DATA2,230,252,177,251,32,205,221,169,58 JJ
•63007 DATA32,210,255,169,0,133,253,230,254,32 OK
•63008 DATA228,3,234,165,253,160,0,170,177,251 LG
•63009 DATA201,32,240,6,138,113,251,69,254,170 BP
•63010 DATA138,133,253,177,251,208,226,165,253
 ,41                                           DD
•63011 DATA240,74,74,74,74,24,105,65,32,210    EK
•63012 DATA255,165,253,41,15,24,105,65,32,210  FO
•63013 DATA255,169,13,32,210,255,173,141,2,41  PK
•63014 DATA1,208,249,230,63,208,2,230,64,230   CB
•63015 DATA251,208,2,230,252,76,74,3,169,236   KH
•63016 DATA160,3,32,30,203,166,63,165,64,32    DP
•63017 DATA205,221,169,13,32,210,255,96,230,25
 1                                             EL
•63018 DATA208,2,230,252,96,0,76,73,78,69      OI
•63019 DATA83,58,32,0,76,73,78,69,32,35        FG
•63020 DATA32,0,0,0,0,0                        LE
```

C-64 VERSION

By Michael Kleinert and David Barron

Type in, SAVE, and RUN the *Bug Repellent*. Type NEW, then type in or LOAD the *Ahoy!* program you wish to check. When that's done, SAVE your program (don't RUN it!) and type SYS 49152 [RETURN].

To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to the codes listed to the right of the respective program lines. If you spot a difference, an error exists in that line. Jot down the number of lines where contradictions occur, LIST each line, spot the errors, and correct them.

```
•5000 FORX=49152TO49488:READY:POKEX,Y:NEXT:END GJ
•5001 DATA32,161,192,165,43,133,251,165,44,133 DL
•5002 DATA252,160,0,132,254,32,37,193,234,177  DB
•5003 DATA251,208,3,76,138,192,230,251,208,2   OF
•5004 DATA230,252,76,43,192,76,73,78,69,32     KN
•5005 DATA35,32,0,169,35,160,192,32,30,171     CA
•5006 DATA160,0,177,251,170,230,251,208,2,230  CE
•5007 DATA252,177,251,32,205,189,169,58,32,210 JE
•5008 DATA255,169,0,133,253,230,254,32,37,193  CL
•5009 DATA234,165,253,160,0,76,13,193,133,253  NB
•5010 DATA177,251,208,237,165,253,41,240,74,74 MB
•5011 DATA74,74,24,105,65,32,210,255,165,253   EP
•5012 DATA41,15,24,105,65,32,210,255,169,13    GH
•5013 DATA32,220,192,230,63,208,2,230,64,230   AN
•5014 DATA251,208,2,230,252,76,11,192,169,153  NG
•5015 DATA160,192,32,30,171,166,63,165,64,76   BF'
•5016 DATA231,192,96,76,73,78,69,83,58,32      EP
•5017 DATA0,169,247,160,192,32,30,171,169,3    PJ
•5018 DATA133,254,32,228,255,201,83,240,6,201  FK
•5019 DATA80,208,245,230,254,32,210,255,169,4  FL
•5020 DATA166,254,160,255,32,186,255,169,0,133 CL
•5021 DATA63,133,64,133,2,32,189,255,32,192    GC
•5022 DATA255,166,254,32,201,255,76,73,193,96  NN
•5023 DATA32,210,255,173,141,2,41,1,208,249    NH
•5024 DATA96,32,205,189,169,13,32,210,255,32   IM
•5025 DATA204,255,169,4,76,195,255,147,83,67   KC
•5026 DATA82,69,69,78,32,79,82,32,80,82        DC
•5027 DATA73,78,84,69,82,32,63,32,0,76         ML
•5028 DATA44,193,234,177,251,201,32,240,6,138  GN
•5029 DATA113,251,69,254,170,138,76,88,192,0   JK
•5030 DATA0,0,0,230,251,208,2,230,252,96       NA
•5031 DATA170,177,251,201,34,208,6,165,2,73    DM
•5032 DATA255,133,2,165,2,208,218,177,251,201  JA
•5033 DATA32,208,212,198,254,76,29,193,0,169   FM
•5034 DATA13,76,210,255,0,0,0                  PA
```

FLANKSPEED FOR THE C-64

By Gordon F. Wheat

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previously saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
•5 POKE53280,12:POKE53281,11 ·                 LL
•6 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[
 15" "]";                                      ED
•10 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY P
 ROGRAM[6" "]"                                 MC
•15 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[
 9" "]"                                        DM
•20 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNA
```

```
 TIONAL INC.[3" "]"                          DH
·30 FORA=54272TO54296:POKEA,0:NEXT           IM
·40 POKE54272,4:POKE54273,48:POKE54277,0:POKE5
 4278,249:POKE54296,15                       NH
·70 FORA=680TO699:READB:POKEA,B:NEXT         KO
·75 DATA169,251,166,253,164,254,32,216,255,96 HJ
·76 DATA169,0,166,251,164,252,32,213,255,96  JB
·80 B$="STARTING ADDRESS IN HEX":GOSUB2010:AD=
 B:SR=B                                      HC
·85 GOSUB2520:IFB=0THEN80                    FO
·86 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16 KE
·90 B$="ENDING ADDRESS IN HEX":GOSUB2010:EN=B IF
·95 GOSUB2510:IFB=0THEN80                    FP
·96 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16    MN
·97 IFB>255THENB=B-255:POKE254,PEEK(254)+1   GE
·98 POKE253,B:PRINT                          HN
·100 REM  GET HEX LINE                       IL
·110 GOSUB3010:PRINT": [c P][LEFT]";:FORA=0TO8 FG
·120 FORB=0TO1:GOTO210                       MD
·125 NEXTB                                   ME
·130 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN310   LH
·135 PRINT" [c P][LEFT]";                    IK
·140 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "   PD
·150 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255  LK
·160 NEXT                                    IA
·170 IFA%(8)<>TTHENGOSUB1010:GOTO110         FK
·180 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOT
 O110                                        MN
·200 REM    GET HEX INPUT                    AB
·210 GETA$:IFA$=""THEN210                    HO
·211 IFA$=CHR$(20)THEN270                    GC
·212 IFA$=CHR$(133)THEN4000                  MD
·213 IFA$=CHR$(134)THEN4100                  KF
·214 IFA$=CHR$(135)THENPRINT" ":GOTO4500     GE
·215 IFA$=CHR$(136)THENPRINT" ":GOTO4700     BJ
·220 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO
 250                                         GM
·230 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO
 250                                         LE
·240 GOSUB1100:GOTO210                       LL
·250 PRINTA$"[c P][LEFT]";                   OA
·260 GOTO125                                 CG
·270 IFA>0THEN280                            OP
·272 A=-1:IFB=1THEN290                       OB
·274 GOTO140                                 CJ
·280 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1  HG
·285 A=A-1                                   BE
·290 PRINTCHR$(20);:GOTO140                  KH
·300 REM LAST LINE                           AD
·310 PRINT" ":T=AD-(INT(AD/256)*256)         GJ
·320 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255 PL
·330 NEXT                                    IA
·340 IFA%(A)<>TTHENGOSUB1010:GOTO110         KF
·350 FORB=0TOA-1:POKEAD+B,A%(B):NEXT         HN
·360 PRINT:PRINT"YOU ARE FINISHED!":GOTO4000 ON
·1000 REM BELL AND ERROR MESSAGES            FL
·1010 PRINT:PRINT"LINE ENTERED INCORRECTLY":PR
 INT:GOTO1100                                DH
·1020 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":
 GOTO1100                                    JA
·1030 PRINT:PRINT"ENDING IS LESS THAN STARTING
 !":B=0:GOTO1100                             HD
·1040 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED
  RANGE!":B=0:GOTO1100                       AG
·1050 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:G
 OTO1100                                     KN
```

```
·1060 PRINT"?ERROR IN SAVE":GOTO1100         EI
·1070 PRINT"?ERROR IN LOAD":GOTO1100         GL
·1080 PRINT:PRINT:PRINT"END OF ML AREA":PRINT PG
·1100 POKE54276,17:POKE54276,16:RETURN       BH
·1200 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA
 $:RETURN                                    IM
·2000 REM GET FOUR DIGIT HEX                 PC
·2010 PRINT:PRINTB$;:INPUTT$                 GM
·2020 IFLEN(T$)<>4THENGOSUB1020:GOTO2010     II
·2040 FORA=1TO4:A$=MID$(T$,A,1):GOSUB2060:IFT(
 A)=16THENGOSUB1020:GOTO2010                 AD
·2050 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+
 T(4):RETURN                                 GF
·2060 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RET
 URN                                         EH
·2070 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RET
 URN                                         KP
·2080 T(A)=16:RETURN                         NP
·2500 REM ADRESS CHECK                       LI
·2510 IFAD>ENTHEN1030                        MI
·2515 IFB<SRORB>ENTHEN1040                   MG
·2520 IFB<256OR(B>4096ANDB<49152)ORB>53247THE
 N1050                                       MI
·2530 RETURN                                 IM
·3000 REM ADDRESS TO HEX                     EB
·3010 AC=AD:A=4096:GOSUB3070                 HG
·3020 A=256:GOSUB3070                        CE
·3030 A=16:GOSUB3070                         PN
·3040 A=1:GOSUB3070                          MJ
·3060 RETURN                                 IM
·3070 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO3
 090                                         CJ
·3080 A$=CHR$(T+48)                          JP
·3090 PRINTA$;:AC=AC-A*T:RETURN              AC
·4000 A$="**SAVE**":GOSUB4200                AI
·4050 OPEN1,T,1,A$:SYS680:CLOSE1             LH
·4060 IFST=0THENEND                          EO
·4070 GOSUB1060:IFT=8THENGOSUB1200           FJ
·4080 GOTO4000                               FF
·4100 A$="**LOAD**":GOSUB4200                AB
·4150 OPEN1,T,0,A$:SYS690:CLOSE1             MF
·4160 IFST=64THEN110                         JH
·4170 GOSUB1070:IFT=8THENGOSUB1200           CM
·4180 GOTO4100                               FO
·4200 PRINT" ":PRINTTAB(14)A$                FG
·4210 PRINT:A$="":INPUT"FILENAME";A$         OM
·4215 IFA$=""THEN4210                        GF
·4220 PRINT:PRINT"TAPE OR DISK?":PRINT       DF
·4230 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RE
 TURN                                        IG
·4240 IFB$<>"T"THEN4230                      FN
·4250 RETURN                                 IM
·4500 B$="CONTINUE FROM ADDRESS":GOSUB2010:AD=
 B                                           DK
·4510 GOSUB2515:IFB=0THEN4500                MA
·4520 PRINT:GOTO110                          OI
·4700 B$="BEGIN SCAN AT ADDRESS":GOSUB2010:AD=
 B                                           FH
·4705 GOSUB2515:IFB=0THEN4700                NK
·4706 PRINT:GOTO4740                         DI
·4710 FORB=0TO7:AC=PEEK(AD+B):GOSUB3030:IFAD+B
 =ENTHENAD=SR:GOSUB1080:GOTO110              BK
·4715 PRINT" ";:NEXTB                        EC
·4720 PRINT:AD=AD+8                          GN
·4730 GETB$:IFB$=CHR$(136)THEN110            MN
·4740 GOSUB3010:PRINT": ";:GOTO4710          JD
```

CHARACTER DEVELOPMENT
FROM PAGE 76

Use of an assembler required for program entry!

MYCHRS

```
*
* MYCHRS
*
          ORG   $8000
*
R6510     EQU   $0001
NEWADR    EQU   $3000
CHRBAS    EQU   $D000
CIACRE    EQU   $DC0E
C2DDRA    EQU   $DD02
MEMREG    EQU   $D018
*
FRETOP    EQU   $0034
MEMSIZ    EQU   $0038
*
TABLEN    EQU   $1000
MVSRCE    EQU   $FB
MVDEST    EQU   MVSRCE+2
CHRADR    EQU   MVDEST
*
LENPTR    EQU   $200
RAMCHR    EQU   LENPTR+2
*
          JMP   START
* A MAN
SHAPE     HEX   18,DB,42,
                7E,18,7E,66,E7
* SET CIA BITS TO OUTPUTS
*
START     LDA   C2DDRA
          ORA   #3
          STA   C2DDRA
*
* CLEAR RAM FOR CHR
* MEMORY
          LDA   #48
          STA   FRETOP
          STA   MEMSIZ
*
* TURN OFF KB INTERRUPT
* TIMER
          LDA   CIACRE
          AND   #$FE
          STA   CIACRE
*
* SWITCH I/O OFF, CHAR
* ROM ON
          LDA   R6510
          AND   #$FB
          STA   R6510
*
* COPY CHARACTERS INTO
* RAM
          LDA   #<CHRBAS
          STA   MVSRCE
          LDA   #>CHRBAS
          STA   MVSRCE+1
*
          LDA   #<NEWADR
          STA   MVDEST
          LDA   #>NEWADR
          STA   MVDEST+1
*
          LDA   #<TABLEN
          STA   LENPTR
          LDA   #>TABLEN
          STA   LENPTR+1
*
* START MOVE
*
          LDY   #0
          LDX   LENPTR+1
          BEQ   MVPART
MVPAGE    LDA   (MVSRCE),Y
          STA   (MVDEST),Y
          INY
          BNE   MVPAGE
          INC   MVSRCE+1
          INC   MVDEST+1
          DEX
          BNE   MVPAGE
MVPART    LDX   LENPTR
          BEQ   MVEXIT
MVLAST    LDA   (MVSRCE),Y
          STA   (MVDEST),Y
          INY
          DEX
          BNE   MVLAST
MVEXIT
*
* SWITCH I/O BACK IN
*
          LDA   R6510
          ORA   #4
          STA   R6510
*
* TURN TIMER BACK ON
*
          LDA   CIACRE
          ORA   #1
          STA   CIACRE
*
* SET VIC MEMORY CONTROL
* REGISTER
          CLC
          LDA   MEMREG
          AND   #$F0
          ADC   #$0C
          STA   MEMREG
*
* NOW WE ALTER A
* CHARACTER (Z)
*
          LDA   #26
          STA   RAMCHR
*
* CALCULATE RAMCHR'S
* ADDRESS
          LDA   #0
          STA   RAMCHR+1
          LDA   RAMCHR
          CLC
          ASL   A
          ROL   RAMCHR+1
          ASL   A
          ROL   RAMCHR+1
          ASL   A
          ROL   RAMCHR+1
          STA   RAMCHR
*
          CLC
          LDA   RAMCHR
          ADC   #<NEWADR
          STA   CHRADR
          LDA   RAMCHR+1
          ADC   #>NEWADR
          STA   CHRADR+1
*
* NOW WE CHANGE THE
* CHARACTER
          LDY   #0
DOSHAPE   LDA   SHAPE,Y
          STA   (CHRADR),Y
          INY
          CPY   #9
          BCC   DOSHAPE
*
          RTS
*
          END
*

```

SHOWCHRS

```
*
* SHOWCHRS
*
          ORG   $8000
*
COLOR     EQU   $10
COLMAP    EQU   $8400
BASE      EQU   $A000
VICTRL    EQU   $D011
CI2PRA    EQU   $DD00
CIADIR    EQU   $DD02
VICMEM    EQU   $D018
```

```
*
HMAX      EQU  320
HMID      EQU  160-4
VMID      EQU  100-4
*
SCRLEN    EQU  8000
MAPLEN    EQU  1000
*
TEMPA     EQU  $FB
TEMPB     EQU  TEMPA+2
*
TABPTR    EQU  TEMPA
TABSIZ    EQU  $02A7
*
HPSN      EQU  TABSIZ+2
VPSN      EQU  HPSN+2
CHAR      EQU  VPSN+1
ROW       EQU  CHAR+1
LINE      EQU  ROW+1
BYTE      EQU  LINE+1
BITT      EQU  BYTE+2
*
MPRL      EQU  BITT+1
MPRH      EQU  MPRL+1
MPDL      EQU  MPRH+1
MPDH      EQU  MPDL+1
PRODL     EQU  MPDH+1
PRODH     EQU  PRODL+1
*
FILVAL    EQU  PRODH+1
*
R6510     EQU  $0001
NEWADR    EQU  $8800
CHRBAS    EQU  $D000
CIACRE    EQU  $DC0E
*
TABLEN    EQU  $800
*
MVSRCE    EQU  $61
MVDEST    EQU  MVSRCE+2
BYTPTR    EQU  MVDEST+2
*
LENPTR    EQU  $9000
CHCODE    EQU  LENPTR+2
HPTR      EQU  CHCODE+2
ONEBYT    EQU  HPTR+1
COUNT     EQU  ONEBYT+2
*
          JMP  START
*
* BLOCK FILL ROUTINE
*
BLKFIL    LDA  FILVAL
          LDX  TABSIZ+1
          BEQ  PARTPG
          LDY  #0
FULLPG    STA  (TABPTR),Y
          INY
          BNE  FULLPG
          INC  TABPTR+1
          DEX
          BNE  FULLPG
PARTPG    LDX  TABSIZ
          BEQ  FINI
          LDY  #0
PARTLP    STA  (TABPTR),Y
          INY
          DEX
          BNE  PARTLP
FINI      RTS
*
* 16-BIT MULTIPLICATION
* ROUTINE
MULT16    LDA  #0
          STA  PRODL
          STA  PRODH
          LDX  #17
          CLC
MULT      ROR  PRODH
          ROR  PRODL
          ROR  MPRH
          ROR  MPRL
          BCC  CTDOWN
          CLC
          LDA  MPDL
          ADC  PRODL
          STA  PRODL
          LDA  MPDH
          ADC  PRODH
          STA  PRODH
CTDOWN    DEX
          BNE  MULT
          RTS
*
* PLOT ROUTINE
*
* ROW=VPSN/8
* (8-BIT DIVIDE)
PLOT      LDA  VPSN
          LSR  A
          LSR  A
          LSR  A
          STA  ROW
*
* CHAR=HPSN/8
* (16-BIT DIVIDE)
          LDA  HPSN
          STA  TEMPA
          LDA  HPSN+1
          STA  TEMPA+1
          LDX  #3
DLOOP     LSR  TEMPA+1
          ROR  TEMPA
          DEX
          BNE  DLOOP
          LDA  TEMPA
          STA  CHAR
*
* LINE=VPSN AND 7
*
          LDA  VPSN
          AND  #7
          STA  LINE
*
* BITT=7-(HPSN AND 7)
*
          LDA  HPSN
          AND  #7
          STA  BITT
          SEC
          LDA  #7
          SBC  BITT
          STA  BITT
*
* BYTE=BASE+ROW*HMAX+8*
* CHAR+LINE
* FIRST MULTIPLY ROW *
* HMAX
          LDA  ROW
          STA  MPRL
          LDA  #0
          STA  MPRH
          LDA  #<HMAX
          STA  MPDL
          LDA  #>HMAX
          STA  MPDH
          JSR  MULT16
          LDA  MPRL
          STA  TEMPA
          LDA  MPRL+1
          STA  TEMPA+1
*
* ADD PRODUCT TO BASE
*
          CLC
          LDA  #<BASE
          ADC  TEMPA
          STA  TEMPA
          LDA  #>BASE
          ADC  TEMPA+1
          STA  TEMPA+1
*
* MULTIPLY 8 * CHAR
*
          LDA  #8
          STA  MPRL
          LDA  #0
          STA  MPRH
          LDA  CHAR
          STA  MPDL
          LDA  #0
          STA  MPDH
          JSR  MULT16
          LDA  MPRL
```

```
         STA   TEMPB
         LDA   MPRH
         STA   TEMPB+1
*
* ADD LINE
*
         CLC
         LDA   TEMPB
         ADC   LINE
         STA   TEMPB
         LDA   TEMPB+1
         ADC   #0
         STA   TEMPB+1
*
* TEMPA + TEMPB = BYTE
*
         CLC
         LDA   TEMPA
         ADC   TEMPB
         STA   TEMPB
         LDA   TEMPA+1
         ADC   TEMPB+1
         STA   TEMPB+1
*
* POKE BYTE,PEEK(BYTE)
* OR2^BIT
         LDX   BITT
         INX
         LDA   #0
         SEC
SQUARE   ROL
         DEX
         BNE   SQUARE
         LDY   #0
         ORA   (TEMPB),Y
         STA   (TEMPB),Y
         RTS
*
* CALCULATE CHCODE'S
* ADDRESS
GETADR   LDA   #0
         STA   CHCODE+1
         LDA   CHCODE
         CLC
         ASL   A
         ROL   CHCODE+1
         ASL   A
         ROL   CHCODE+1
         ASL   A
         ROL   CHCODE+1
         STA   CHCODE
*
         CLC
         LDA   CHCODE
         ADC   #<NEWADR
         STA   BYTPTR
         LDA   CHCODE+1
         ADC   #>NEWADR
         STA   BYTPTR+1
         RTS
*
* MAIN ROUTINE STARTS
* HERE
START    LDA   VICMEM
         ORA   #8
         STA   VICMEM
*
         LDA   VICTRL
         ORA   #32
         STA   VICTRL
*
* USE BANK 2
*
         LDA   CIADIR
         ORA   #3
         STA   CIADIR
*
         LDA   CI2PRA
         AND   #252
         ORA   #1
* BANK 2
         STA   CI2PRA
*
* CLEAR BIT MAP
*
         LDA   #0
         STA   FILVAL
         LDA   #<BASE
         STA   TABPTR
         LDA   #>BASE
         STA   TABPTR+1
         LDA   #<SCRLEN
         STA   TABSIZ
         LDA   #>SCRLEN
         STA   TABSIZ+1
         JSR   BLKFIL
*
* SET BKG AND LINE
* COLORS
         LDA   #COLOR
         STA   FILVAL
         LDA   #<COLMAP
         STA   TABPTR
         LDA   #>COLMAP
         STA   TABPTR+1
         LDA   #<MAPLEN
         STA   TABSIZ
         LDA   #>MAPLEN
         STA   TABSIZ+1
         JSR   BLKFIL
*
* TURN OFF KB INTERRUPT
* TIMER
MVCHRS   LDA   CIACRE
         AND   #$FE
         STA   CIACRE
*
* SWITCH BASIC OUT
*
         LDA   R6510
         AND   #$FE
         STA   R6510
*
* SWITCH I/O OFF, CHAR
* ROM ON
         LDA   R6510
         AND   #$FB
         STA   R6510
*
* COPY CHARACTERS INTO
* RAM
         LDA   #<CHRBAS
         STA   MVSRCE
         LDA   #>CHRBAS
         STA   MVSRCE+1
*
         LDA   #<NEWADR
         STA   MVDEST
         LDA   #>NEWADR
         STA   MVDEST+1
*
         LDA   #<TABLEN
         STA   LENPTR
         LDA   #>TABLEN
         STA   LENPTR+1
*
* START MOVE
*
         LDY   #0
         LDX   LENPTR+1
         BEQ   MVPART
MVPAGE   LDA   (MVSRCE),Y
         STA   (MVDEST),Y
         INY
         BNE   MVPAGE
         INC   MVSRCE+1
         INC   MVDEST+1
         DEX
         BNE   MVPAGE
MVPART   LDX   LENPTR
         BEQ   MVEXIT
MVLAST   LDA   (MVSRCE),Y
         STA   (MVDEST),Y
         INY
         DEX
         BNE   MVLAST
MVEXIT
*
* SWITCH I/O BACK IN
*
         LDA   R6510
         ORA   #4
         STA   R6510
*
```

```
361 * TURN TIMER BACK ON
362 *
363           LDA   CIACRE
364           ORA   #1
365           STA   CIACRE
366 *
367 * DRAW A CHARACTER
368 *
369           LDA   #<HMID
370           STA   HPSN
371           STA   HPTR
372           LDA   #>HMID
373           STA   HPSN+1
374           STA   HPTR+1
375           LDA   #VMID
376           STA   VPSN
377 * 'A'
378           LDA   #1
379           STA   CHCODE
380           JSR   GETADR
381 *
382 * A NESTED LOOP:
383 *
384 * X IS THE OUTSIDE LOOP
385 *
386           LDX   #8
387 SETBIT    LDY   #0
388           LDA   (BYTPTR),Y
389           STA   ONEBYT
390 *
391 * THE INSIDE LOOP:
392 *
393 * (Y IS ZERO AT START)
394 *
395 RSHIFT    LDA   ONEBYT
396           ASL   A
397           STA   ONEBYT
398           BCC   NOSHOW
399 *
400 * DISPLAY BIT
401 *
402 * SAVE X AND Y REGISTERS
403 *
404           TXA
405           PHA
406           TYA
407           PHA
408 *
409           JSR   PLOT
410 *
411 * RETRIEVE X AND Y
412 * REGISTERS
413           PLA
414           TAY
415           PLA
416           TAX
417 *
418 NOSHOW    INC   HPSN
419           BNE   LEAP
420           INC   HPSN+1
421 *
422 LEAP      INY
423           CPY   #8
424           BCC   RSHIFT
425 *
426           INC   VPSN
427 *
428           LDA   HPTR
429           STA   HPSN
430           LDA   HPTR+1
431           STA   HPSN+1
432 *
433           INC   BYTPTR
434           BNE   OKMSB
435           INC   BYTPTR+1
436 OKMSB
437 *
438           DEX
439           BNE   SETBIT
440 *
441 INF       JMP   INF
442 *
```

VERY-ABLE
FROM PAGE 52

```
•10 REM *** VERY-ABLE *** BUCK CHILDRESS
 (11/25/85) ***                          CL
•20 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 ***                                   DC
•30 PRINTCHR$(147)"LOADING AND CHECKING D
 ATA[3"."]":PRINT:J=49152:L=90:C=11      MB
•40 FORB=0TOC:READA:POKEJ+B,A:X=X+A:NEXTB
 :READA                                  FE
•50 IFX<>ATHENPRINT"ERROR IN DATA LINE"L:
 END                                     MC
•60 X=0:J=J+12:L=L+10:IFL<470THEN40      AL
•70 IFL=470THENC=4:GOTO40                BN
•80 PRINT"DATA OK AND LOADED[3"."]":PRINT
 :PRINT"SYS 49152 TO ACTIVATE[3"."]":END MM
•90 DATA32,68,229,173,1,8,162,8,133,253,1
 34,252,1453                             NL
•100 DATA134,254,169,1,133,251,160,0,152,
 145,45,153,1597                         BM
•110 DATA0,194,153,0,195,200,208,245,141,
 244,193,141,1914                        FO
•120 DATA245,193,141,251,193,141,253,193,
 141,255,193,162,2361                    EP
•130 DATA0,232,208,253,160,2,177,251,200,
 209,251,208,2151                        NA
•140 DATA7,201,0,208,3,76,219,192,170,173
 ,253,193,1695                           DM
•150 DATA208,19,138,72,152,72,166,214,160
 ,0,24,32,1257                           DM
•160 DATA240,255,104,168,104,170,76,204,1
 92,169,0,141,1823                       CJ
•170 DATA253,193,238,251,193,173,251,193,
 201,12,144,75,2177                      AH
•180 DATA169,0,141,251,193,32,225,255,208
 ,1,96,173,1744                          PA
•190 DATA141,2,201,2,208,13,173,245,193,2
 01,255,240,1874                         PB
•200 DATA45,238,245,193,76,178,192,201,4,
 208,226,173,1979                        KM
•210 DATA245,193,240,3,206,245,193,172,24
 5,193,185,0,2120                        EP
•220 DATA194,133,251,185,0,195,133,252,16
 0,0,177,251,1931                        MH
•230 DATA133,253,200,177,251,133,254,140,
 244,193,169,147,2294                    LK
•240 DATA76,185,192,169,13,32,210,255,173
 ,244,193,240,1982                       BO
•250 DATA11,169,0,141,244,193,160,2,177,2
 51,170,200,1718                         MK
•260 DATA177,251,32,205,189,173,255,193,2
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 95 and 96 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
08,5,169,32,1889                          JK
•270 DATA32,210,255,162,0,142,254,193,160
,3,169,0,1580                             EP
•280 DATA141,252,193,173,255,193,240,10,1
62,0,142,255,2016                         PB
•290 DATA193,169,32,32,210,255,200,177,25
1,240,8,201,1968                          AN
•300 DATA131,240,4,201,143,208,3,76,109,1
93,201,34,1543                            CI
•310 DATA208,19,174,254,193,208,6,141,254
,193,76,226,1952                          LH
•320 DATA192,169,0,141,254,193,76,226,192
,174,254,193,2064                         AA
•330 DATA208,192,201,65,144,27,201,91,176
,184,141,255,1885                         JN
•340 DATA193,174,252,193,240,50,162,0,142
,252,193,72,1923                          HF
•350 DATA169,32,32,210,255,104,76,100,193
,174,255,193,1793                         PP
•360 DATA240,176,201,58,176,152,201,48,17
6,22,201,36,1687                          PG
•370 DATA208,6,141,252,193,76,100,193,201
,40,208,5,1623                            IL
•380 DATA169,42,32,210,255,76,226,192,32,
210,255,141,1840                          KH
•390 DATA253,193,76,246,192,173,251,193,2
08,13,172,245,2215                        JB
•400 DATA193,165,251,153,0,194,165,252,15
3,0,195,166,1887                          HN
•410 DATA253,165,254,240,20,134,251,133,2
52,160,0,177,2039                         BC
•420 DATA253,72,200,177,253,133,254,104,1
33,253,76,47,1955                         NH
•430 DATA192,173,253,193,208,11,166,214,1
60,0,24,32,1626                           BN
•440 DATA240,255,76,174,193,169,13,32,210
,255,160,40,1817                          PJ
•450 DATA169,45,32,210,255,136,208,250,32
,225,255,208,2025                         BA
•460 DATA1,96,173,141,2,201,4,208,243,169
,0,141,1379                               LD
•470 DATA251,193,76,143,192,855           MO
```

EASY LISTER
FROM PAGE 51

```
•1 PRINT"[CLEAR][DOWN][DOWN][14"[RIGHT]"]
[BLACK]EASY LISTER"                       AH
•2 PRINT"[DOWN][DOWN][12"[RIGHT]"]BY J. R
OY PINEAU"                                AN
•5 PRINT"[5"[DOWN]"][9"[RIGHT]"][c 7]PLEA
SE WAIT 45 SECONDS"                       PG
•10 FORX=40960TO49151:POKEX,PEEK(X):NEXTX DA
•20 POKE1,54:POKE42740,0:POKE42741,192    FC
•30 FORI=49152TO50379:READA:POKEI,A:NEXTI CF
•40 POKE631,147:POKE632,13:POKE633,78:POK
E634,69:POKE635,87:POKE636,13:POKE198,6   AA
•100 DATA201,5,208,30,72,8,169,60,32,210  BI
•101 DATA255,169,87,32,210,255,169,72,32,
210                                       OA
•102 DATA255,169,84,32,210,255,169,62,32,
210                                       EK
•103 DATA255,40,104,96,201,28,208,30,72,8 HE
•104 DATA169,60,32,210,255,169,82,32,210,
255                                       MO
•105 DATA169,69,32,210,255,169,68,32,210,
255                                       CH
•106 DATA169,62,32,210,255,40,104,96,201,
30                                        EG
•107 DATA208,30,72,8,169,60,32,210,255,16
9                                         GL
•108 DATA71,32,210,255,169,82,32,210,255,
169                                       AE
•109 DATA78,32,210,255,169,62,32,210,255,
40                                        GB
•110 DATA104,96,201,31,208,30,72,8,169,60 OI
•111 DATA32,210,255,169,66,32,210,255,169
,76                                       BH
•112 DATA32,210,255,169,85,32,210,255,169
,62                                       CD
•113 DATA32,210,255,40,104,96,201,129,208
,30                                       AG
•114 DATA72,8,169,60,32,210,255,169,79,32 BH
•115 DATA210,255,169,82,32,210,255,169,71
,32                                       FM
•116 DATA210,255,169,62,32,210,255,40,104
,96                                       PD
•117 DATA201,144,208,30,72,8,169,60,32,21
0                                         HN
•118 DATA255,169,66,32,210,255,169,76,32,
210                                       EN
•119 DATA255,169,75,32,210,255,169,62,32,
210                                       EO
•120 DATA255,40,104,96,201,149,208,30,72,
8                                         OO
•121 DATA169,60,32,210,255,169,66,32,210,
255                                       BI
•122 DATA169,82,32,210,255,169,78,32,210,
255                                       GJ
•123 DATA169,62,32,210,255,40,104,96,201,
150                                       JN
•124 DATA208,30,72,8,169,60,32,210,255,16
9                                         GL
•125 DATA76,32,210,255,169,82,32,210,255,
169                                       KN
•126 DATA68,32,210,255,169,62,32,210,255,
40                                        KK
•127 DATA104,96,201,151,208,30,72,8,169,6
0                                         MF
```

```
·128 DATA32,210,255,169,71,32,210,255,169
 ,89                                      OL
·129 DATA32,210,255,169,49,32,210,255,169
 ,62                                      CD
·130 DATA32,210,255,40,104,96,201,152,208
 ,30                                      BC
·131 DATA72,8,169,60,32,210,255,169,71,32 MP
·132 DATA210,255,169,89,32,210,255,169,50
 ,32                                      EK
·133 DATA210,255,169,62,32,210,255,40,104
 ,96                                      PD
·134 DATA201,153,208,30,72,8,169,60,32,21
 0                                        FL
·135 DATA255,169,76,32,210,255,169,71,32,
 210                                      OP
·136 DATA255,169,78,32,210,255,169,62,32,
 210                                      BN
·137 DATA255,40,104,96,201,154,208,30,72,
 8                                        DI
·138 DATA169,60,32,210,255,169,76,32,210,
 255                                      MH
·139 DATA169,66,32,210,255,169,76,32,210,
 255                                      MJ
·140 DATA169,62,32,210,255,40,104,96,201,
 155                                      KA
·141 DATA208,30,72,8,169,60,32,210,255,16
 9                                        GL
·142 DATA71,32,210,255,169,89,32,210,255,
 169                                      EB
·143 DATA51,32,210,255,169,62,32,210,255,
 40                                       MG
·144 DATA104,96,201,156,208,30,72,8,169,6
 0                                        EM
·145 DATA32,210,255,169,80,32,210,255,169
 ,85                                      JB
·146 DATA32,210,255,169,82,32,210,255,169
 ,62                                      HI
·147 DATA32,210,255,40,104,96,201,158,208
 ,30                                      FA
·148 DATA72,8,169,60,32,210,255,169,89,32 BG
·149 DATA210,255,169,69,32,210,255,169,76
 ,32                                      PI
·150 DATA210,255,169,62,32,210,255,40,104
 ,96                                      PD
·151 DATA201,159,208,30,72,8,169,60,32,21
 0                                        AB
·152 DATA255,169,67,32,210,255,169,89,32,
 210                                      CG
·153 DATA255,169,78,32,210,255,169,62,32,
 210                                      BN
·154 DATA255,40,104,96,201,17,208,30,72,8 AO
·155 DATA169,60,32,210,255,169,68,32,210,
 255                                      EC
·156 DATA169,87,32,210,255,169,78,32,210,
 255                                      OG
·157 DATA169,62,32,210,255,40,104,96,201,
 29                                       EK
·158 DATA208,30,72,8,169,60,32,210,255,16
 9                                        GL
·159 DATA82,32,210,255,169,71,32,210,255,
 169                                      LM
·160 DATA84,32,210,255,169,62,32,210,255,
 40                                       GA
·161 DATA104,96,201,145,208,30,72,8,169,6
 0                                        IG
·162 DATA32,210,255,234,234,234,234,234,1
 69,85                                    KL
·163 DATA32,210,255,169,80,32,210,255,169
 ,62                                      IG
·164 DATA32,210,255,40,104,96,201,157,208
 ,30                                      FJ
·165 DATA72,8,169,60,32,210,255,169,76,32 BA
·166 DATA210,255,169,70,32,210,255,169,84
 ,32                                      IJ
·167 DATA210,255,169,62,32,210,255,40,104
 ,96                                      PD
·168 DATA201,19,208,30,72,8,169,60,32,210 BI
·169 DATA255,169,72,32,210,255,169,79,32,
 210                                      JD
·170 DATA255,169,77,32,210,255,169,62,32,
 210                                      HM
·171 DATA255,40,104,96,201,147,208,30,72,
 8                                        GM
·172 DATA169,60,32,210,255,169,67,32,210,
 255                                      MH
·173 DATA169,76,32,210,255,169,82,32,210,
 255                                      CF
·174 DATA169,62,32,210,255,40,104,96,201,
 18                                       EM
·175 DATA208,30,72,8,169,60,32,210,255,16
 9                                        GL
·176 DATA82,32,210,255,169,69,32,210,255,
 169                                      EB
·177 DATA86,32,210,255,169,62,32,210,255,
 40                                       MO
·178 DATA104,96,201,146,208,30,72,8,169,6
 0                                        GB
·179 DATA32,210,255,169,82,32,210,255,169
 ,79                                      HO
·180 DATA32,210,255,169,70,32,210,255,169
 ,62                                      PL
·181 DATA32,210,255,40,104,96,201,20,208,
 30                                       JC
·182 DATA72,8,169,60,32,210,255,169,68,32 BL
·183 DATA210,255,169,69,32,210,255,169,76
 ,32                                      PI
·184 DATA210,255,169,62,32,210,255,40,104
 ,96                                      PD
·185 DATA201,148,208,30,72,8,169,60,32,21
 0                                        AB
·186 DATA255,169,73,32,210,255,169,78,32,
 210                                      IB
·187 DATA255,169,83,32,210,255,169,62,32,
 210                                      MF
·188 DATA255,40,104,96,201,133,208,30,72,
 8                                        PD
```

```
•189 DATA169,60,32,210,255,234,234,234,23
 4,234                                     MG
•190 DATA169,70,32,210,255,169,49,32,210,
 255                                       DA
•191 DATA169,62,32,210,255,40,104,96,201,
 137                                       JM
•192 DATA208,30,72,8,169,60,32,210,255,23
 4                                         GC
•193 DATA234,234,234,234,169,70,32,210,25
 5,169                                     GG
•194 DATA50,32,210,255,169,62,32,210,255,
 40                                        KH
•195 DATA104,96,201,134,208,30,72,8,169,6
 0                                         KM
•196 DATA32,210,255,234,234,234,234,234,1
 69,70                                     KH
•197 DATA32,210,255,169,51,32,210,255,169
 ,62                                       GC
•198 DATA32,210,255,40,104,96,201,138,208
 ,30                                       EO
•199 DATA72,8,169,60,32,210,255,234,234,2
 34                                        PO
•200 DATA234,234,169,70,32,210,255,169,52
 ,32                                       MP
•201 DATA210,255,169,62,32,210,255,40,104
 ,96                                       PD
•202 DATA201,135,208,30,72,8,169,60,32,21
 0                                         KP
•203 DATA255,234,234,234,234,234,169,70,3
 2,210                                     IL
•204 DATA255,169,53,32,210,255,169,62,32,
 210                                       KG
•205 DATA255,40,104,96,201,139,208,30,72,
 8                                         PJ
•206 DATA169,60,32,210,255,234,234,234,23
 4,234                                     MG
•207 DATA169,70,32,210,255,169,54,32,210,
 255                                       JM
•208 DATA169,62,32,210,255,40,104,96,201,
 136                                       JN
•209 DATA208,30,72,8,169,60,32,210,255,23
 4                                         GC
•210 DATA234,234,234,234,169,70,32,210,25
 5,169                                     GG
•211 DATA55,32,210,255,169,62,32,210,255,
 40                                        OC
•212 DATA104,96,201,140,208,30,72,8,169,6
 0                                         KP
•213 DATA32,210,255,234,234,234,234,234,1
 69,70                                     KH
•214 DATA32,210,255,169,56,32,210,255,169
 ,62                                       OP
•215 DATA32,210,255,40,104,96,201,14,208,
 30                                        JL
•216 DATA72,8,169,60,32,210,255,169,76,32 BA
•217 DATA210,255,169,79,32,210,255,169,87
 ,32                                       PD
•218 DATA210,255,169,62,32,210,255,40,104 .
 ,96                                       PD
•219 DATA201,142,208,30,72,8,169,60,32,21
 0                                         FL
•220 DATA255,169,85,32,210,255,169,80,32,
 210                                       BL
•221 DATA255,169,82,32,210,255,169,62,32,
 210                                       AE
•222 DATA255,40,104,96,76,71,171,0         GF
```

BRICKBUSTERS

FROM PAGE 55

Starting Address: C000
Ending Address: CF11
SYS to Start: 49152
***Flankspeed* required for entry. See page 96.**

```
C000: A9 00 8D 15 D0 8D 63 03 11
C008: 8D 64 03 8D 20 D0 8D 21 2A
C010: D0 AD 41 C0 C9 65 D0 0C 9C
C018: A9 30 A2 00 9D 5C 03 E8 7A
C020: E0 07 D0 F8 A9 65 8D 41 AF
C028: C0 A9 93 20 D2 FF A9 12 D4
C030: 20 D2 FF A2 05 A0 0B 18 8E
C038: 20 F0 FF 8E 63 03 A2 00 E0
C040: BD 65 C0 20 D2 FF E8 E0 E0
C048: 11 D0 F5 EE 64 03 AE 63 88
C050: 03 E8 18 A9 11 6D 41 C0 7E
C058: 8D 41 C0 A9 07 CD 64 03 CD
C060: D0 D5 4C DC C0 1F 20 20 50
C068: 20 20 20 20 20 20 20 20 69
C070: 20 20 20 20 20 20 9E 20 EF
C078: 20 42 52 49 43 4B 42 55 9C
C080: 53 54 45 52 53 20 20 1C 6F
C088: 20 20 20 20 20 20 20 20 89
C090: 20 20 20 20 20 20 20 20 91
C098: 1E 20 20 20 20 20 20 20 97
C0A0: 42 59 20 20 20 20 20 20 FC
C0A8: 20 81 20 20 20 20 20 20 0B
C0B0: 20 20 20 20 20 20 20 20 B1
C0B8: 20 20 9A 20 50 41 55 4C E6
C0C0: 20 53 45 45 42 55 52 47 EF
C0C8: 45 52 20 95 20 20 20 20 96
C0D0: 20 20 20 20 20 20 20 20 D1
C0D8: 20 20 20 20 A9 92 20 D2 88
C0E0: FF A9 9A 20 D2 FF A2 0E C8
C0E8: A0 0A 18 20 F0 FF A2 00 5F
C0F0: BD FE C0 20 D2 FF E8 E0 2B
C0F8: 12 D0 F5 4C 10 C1 42 41 73
C100: 4C 4C 20 53 50 45 45 44 2B
C108: 20 28 30 2D 34 29 3F 20 6A
C110: 20 CF FF C9 00 F0 F9 C9 7E
C118: 0D F0 1C C9 30 D0 08 A2 A7
C120: FE 8E 34 03 4C 57 C1 C9 14
C128: 31 D0 08 A2 CC 8E 34 03 67
C130: 4C 57 C1 C9 32 D0 08 A2 0D
C138: 98 8E 34 03 4C 57 C1 C9 C5
C140: 33 D0 08 A2 66 8E 34 03 1B
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C148: 4C 57 C1 C9 34 D0 E8 A2 08
C150: 32 8E 34 03 4C 57 C1 A2 50
C158: 10 A0 09 18 20 F0 FF A2 DD
C160: 00 BD 6F C1 20 D2 FF E8 2B
C168: E0 13 D0 F5 4C 82 C1 42 F5
C170: 4F 41 52 44 20 53 50 45 A0
C178: 45 44 20 28 30 2D 39 29 0A
C180: 3F 20 20 CF FF C9 00 F0 8A
C188: F9 C9 30 90 0F C9 3A B0 D0
C190: 0B 38 E9 30 AA E8 8E 66 76
C198: 03 4C A1 C1 A2 04 8E 66 E6
C1A0: 03 A2 12 A0 0A 18 20 F0 2C
C1A8: FF A2 00 BD B9 C1 20 D2 77
C1B0: FF E8 E0 12 D0 F5 4C CB 6B
C1B8: C1 42 4F 41 52 44 20 53 57
C1C0: 49 5A 45 20 28 53 2C 4C BD
C1C8: 29 3F 20 20 CF FF C9 00 0B
C1D0: F0 F9 C9 53 D0 12 A2 00 5E
C1D8: 8E 1D D0 A2 40 8E 35 03 FE
C1E0: A2 12 8E 65 03 4C F7 C1 92
C1E8: A2 01 8E 1D D0 A2 28 8E 62
C1F0: 35 03 A2 0C 8E 65 03 A2 71
C1F8: 00 A9 00 9D 80 03 E8 E0 8D
C200: 36 D0 F6 A9 03 9D 80 03 CB
C208: E8 A9 FF 9D 80 03 9D 81 DA
C210: 03 E8 E8 A9 03 9D 80 03 B2
C218: E8 A9 FF 9D 80 03 9D 81 EA
C220: 03 E8 E8 A9 03 9D 80 03 C2
C228: E8 A9 FF 9D 80 03 9D 81 FA
C230: 03 E8 E8 A9 00 9D 80 03 CF
C238: E8 A9 60 9D 80 03 E8 A9 DE
C240: 00 9D 80 03 9D 81 03 E8 6C
C248: E8 A9 F0 9D 80 03 E8 A9 7F
C250: 00 9D 80 03 9D 81 03 E8 7C
C258: E8 A9 F0 9D 80 03 E8 A9 8F
C260: 00 9D 80 03 9D 81 03 E8 8C
C268: E8 A9 60 9D 80 03 E8 A9 0F
C270: 00 9D 80 03 E8 E0 80 D0 AC
C278: F6 A2 14 A0 06 18 20 F0 F5
C280: FF A2 00 BD 91 C2 20 D2 28
C288: FF E8 E0 16 D0 F5 4C A7 23
C290: C2 4E 4F 2E 20 4F 46 20 F4
C298: 50 4C 41 59 45 52 53 20 DA
C2A0: 28 31 2D 34 29 3F 20 20 04
C2A8: CF FF C9 00 F0 F9 C9 31 28
C2B0: F0 0E C9 32 F0 0A C9 33 A3
C2B8: F0 06 C9 34 F0 02 A9 31 7B
C2C0: 38 E9 30 8D 36 03 A2 16 92
C2C8: A0 0A 18 20 F0 FF A2 00 3F
C2D0: BD DE C2 20 D2 FF E8 E0 EC
C2D8: 16 D0 F5 4C F4 C2 12 4A 16
C2E0: 92 4F 59 53 54 49 43 4B 9B
C2E8: 20 4F 52 20 12 4B 92 45 FF
C2F0: 59 53 3F 20 20 CF FF C9 B6
C2F8: 00 F0 F9 C9 4B D0 0B A2 77
C300: D7 86 4B A2 CD 86 4C 4C 39
C308: 12 C3 A2 19 86 4B A2 CD DB
C310: 86 4C A9 01 8D 38 03 8D E3
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C318: 39 03 A9 0E 8D F8 07 A9 43
C320: 0F 8D F9 07 A9 01 8D 28 1E
C328: D0 A9 02 8D 3C 03 8D 3D 3C
C330: 03 8D 3E 03 8D 3F 03 A9 7B
C338: 30 A2 00 9D 40 03 E8 E0 B5
C340: 1C D0 F8 4C 4E C3 78 00 FC
C348: A0 00 B4 00 04 01 A9 00 4C
C350: 8D 6B 03 8D 6C 03 8D 6D 44
C358: 03 8D 6E 03 A2 01 4C DC 27
C360: C3 A9 00 8D 15 D0 EE 37 67
C368: 03 AC 37 03 88 CC 36 03 E0
C370: D0 57 A9 01 8D 37 03 EE F9
C378: 38 03 CE 34 03 A9 FF CD 31
C380: 34 03 D0 05 A9 00 8D 34 F8
C388: 03 A9 00 CD 38 03 D0 05 14
C390: A9 FF 8D 38 03 EE 39 03 2E
C398: AD 39 03 C9 05 D0 05 A9 D0
C3A0: 01 8D 39 03 EE 3C 03 EE 88
C3A8: 3D 03 EE 3E 03 EE 3F 03 4A
C3B0: A2 01 A9 00 DD 6A 03 F0 3A
C3B8: 23 EC 36 03 F0 04 E8 4C 2C
C3C0: B4 C3 A9 00 85 C6 4C 00 7B
C3C8: C0 AE 37 03 A9 00 DD 6A 64
C3D0: 03 F0 09 EC 36 03 F0 9A 7F
C3D8: E8 4C CE C3 8E 37 03 A9 13
C3E0: 93 20 D2 FF A2 0A A0 0F C3
C3E8: 18 20 F0 FF A9 0F 8D 18 70
C3F0: D4 A9 46 8D 02 D4 A9 01 C4
C3F8: 8D 03 D4 A9 8C 8D 05 D4 FB
C400: 8D 06 D4 A2 00 BD 49 C4 D6
C408: BC 4A C4 8D 00 D4 8C 01 C3
C410: D4 E8 E8 A9 41 8D 04 D4 08
C418: BD 55 C4 20 D2 FF A9 00 8C
C420: 8D 63 03 8D 64 03 EE 63 5B
C428: 03 AD 63 03 D0 F8 EE 64 5C
C430: 03 A9 00 8D 63 03 AD 64 E2
C438: 03 C9 40 D0 E9 E0 0C D0 BD
C440: C4 A9 40 8D 04 D4 4C 62 04
C448: C4 61 08 E1 08 F7 09 4E AF
C450: 0D F7 09 4E 0D 00 00 50 0A
C458: 00 4C 00 41 00 59 00 45 84
C460: 00 52 A9 20 20 D2 FF A0 10
C468: 00 A2 00 E8 D0 FD C8 D0 5C
C470: FA A9 43 8D 00 D4 A9 0F 73
C478: 8D 01 D4 A9 81 8D 04 D4 6D
C480: AE 37 03 A9 00 20 CD BD BE
C488: A2 0F 8E 18 D4 A0 FF 8C E2
C490: 63 03 EE 63 03 AD 63 03 60
C498: C9 FF D0 F6 C8 C0 20 D0 A4
C4A0: F1 CA E0 04 D0 E4 A2 00 9A
C4A8: E8 D0 FD A9 80 8D 04 D4 F0
C4B0: 8E 63 03 A0 00 A2 00 E8 D1
C4B8: D0 FD C8 D0 F8 EE 63 03 6F
C4C0: AD 63 03 C9 06 D0 EC A9 0C
C4C8: 93 20 D2 FF A9 05 20 D2 F0
C4D0: FF A2 02 A0 00 18 20 F0 3F
C4D8: FF A9 A8 20 D2 FF C8 C0 A7
C4E0: 28 D0 F8 AD 39 03 C9 01 87
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C4E8: D0 44 A2 00 A9 12 20 D2 4F
C4F0: FF BD 26 C5 F0 1C 20 D2 9A
C4F8: FF A0 00 A9 6F 20 D2 FF A5
C500: A9 B7 20 D2 FF C8 C0 14 F1
C508: D0 F1 E8 E0 08 D0 DD 4C 97
C510: F8 C5 A9 92 20 D2 FF A9 A7
C518: 20 A0 00 20 D2 FF C8 C0 55
C520: 28 D0 F8 4C 0A C5 1C 9F E9
C528: 9C 00 00 1E 1F 9E C9 02 6C
C530: D0 46 A2 00 A9 12 20 D2 98
C538: FF BD 6E C5 F0 1C 20 D2 2A
C540: FF A0 00 A9 6F 20 D2 FF EC
C548: A9 B7 20 D2 FF C8 C0 14 3A
C550: D0 F1 E8 E0 0A D0 DD 4C E1
C558: F8 C5 A9 92 20 D2 FF A9 EF
C560: 20 A0 00 20 D2 FF C8 C0 9D
C568: 28 D0 F8 4C 52 C5 1C 9F 7A
C570: 9C 1E 00 00 1F 9E 81 95 FF
C578: C9 03 D0 49 A2 00 A9 12 BD
C580: 20 D2 FF BD B8 C5 F0 1C BC
C588: 20 D2 FF A0 00 A9 6F 20 55
C590: D2 FF A9 B7 20 D2 FF C8 80
C598: C0 14 D0 F1 E8 E0 0D D0 D7
C5A0: DD 4C F8 C5 A9 92 20 D2 B8
C5A8: FF A9 20 A0 00 20 D2 FF 06
C5B0: C8 C0 28 D0 F8 4C 9C C5 DA
C5B8: 1C 9F 9C 00 00 1E 1F 9E EC
C5C0: 00 00 81 95 99 A2 00 A9 BD
C5C8: 12 20 D2 FF BD EB C5 20 5D
C5D0: D2 FF A0 00 A9 6F 20 D2 50
C5D8: FF A9 B7 20 D2 FF C8 C0 B6
C5E0: 14 D0 F1 E8 E0 0D D0 DF 3F
C5E8: 4C F8 C5 1C 9F 9C 97 96 7A
C5F0: 1E 1F 9E 05 98 81 95 99 1B
C5F8: A9 0B 8D 20 D0 AE 39 03 17
C600: CA 8A 0A AA BD 46 C3 8D 5F
C608: 3A 03 BD 47 C3 8D 3B 03 D9
C610: A9 97 8D 00 D0 A9 DC 8D C3
C618: 01 D0 A9 00 8D 10 D0 A9 AB
C620: 0F 8D 18 D4 78 A5 4B 8D A0
C628: 14 03 A5 4C 8D 15 03 58 2F
C630: A9 9E 20 D2 FF A2 00 BD CB
C638: 45 C6 9D 00 04 E8 E0 48 F7
C640: D0 F5 4C 8C C6 93 83 8F 4D
C648: 92 85 3A 20 20 20 20 20 3B
C650: 20 20 20 20 82 81 8C 8C ED
C658: 93 A0 3A 20 20 20 88 89 39
C660: 87 88 A0 3A 20 20 20 20 CB
C668: 20 20 20 20 20 8C 85 96 B1
C670: 85 8C 3A 20 20 20 20 20 5D
C678: 20 20 20 20 90 8C 81 99 31
C680: 85 92 3A 20 20 20 A3 8C 63
C688: 85 86 94 3A A2 00 A9 07 B6
C690: 9D 00 D8 E8 E0 50 D0 F8 EA
C698: A9 92 20 D2 FF A2 01 A0 0C
C6A0: 06 18 20 F0 FF A9 63 8D 6A
C6A8: 63 03 AE 38 03 A9 00 20 C2
C6B0: CD BD A2 01 A0 16 18 20 CE
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C6B8: F0 FF AE 37 03 A9 00 20 5C
C6C0: CD BD A2 00 A0 16 18 20 DD
C6C8: F0 FF AE 37 03 CA BD 3C 67
C6D0: 03 AA E8 A9 00 20 CD BD BC
C6D8: A0 06 AD 37 03 0A 0A 0A 85
C6E0: 38 ED 37 03 AA CA 20 58 2F
C6E8: CB 20 8D CB 20 01 CC A9 C5
C6F0: 00 8D 63 03 AD 1F D0 20 A2
C6F8: AE CB A2 00 A0 16 18 20 05
C700: F0 FF AE 37 03 CA BD 3C 9E
C708: 03 AA A9 00 20 CD BD A9 B4
C710: 20 20 D2 FF AD 10 D0 29 DA
C718: 01 8D 10 D0 A9 DC 8D 03 9E
C720: D0 20 97 E0 A5 8C 18 69 3D
C728: 50 8D 02 D0 A9 03 8D 15 28
C730: D0 A9 02 8D 70 03 20 0F DC
C738: CC AD 8D 02 C9 01 F0 F9 F7
C740: A5 CB C9 01 D0 09 20 49 BF
C748: C8 4C C2 C3 4C 88 C8 A2 24
C750: 00 A0 00 AD 6F 03 30 F4 36
C758: AD 70 03 30 71 EC 6F 03 7A
C760: F0 28 EE 02 D0 AD 02 D0 BB
C768: D0 08 AD 10 D0 09 02 8D 68
C770: 10 D0 E8 AD 10 D0 29 02 F3
C778: F0 10 A9 54 CD 02 D0 B0 C8
C780: 09 20 07 CD AE 6F 03 20 BF
C788: EA CE CC 70 03 F0 25 EE 87
C790: 03 D0 A9 FA CD 03 D0 D0 7B
C798: 03 4C 2C C8 C8 AD 1E D0 42
C7A0: 29 02 F0 03 4C 56 C8 AD D8
C7A8: 1F D0 29 02 F0 03 4C 8C 90
C7B0: C9 4C 5D C7 EC 6F 03 D0 1C
C7B8: E4 A2 00 EC 34 03 F0 0B 60
C7C0: A0 00 C8 C0 19 D0 FB E8 B9
C7C8: 4C BB C7 4C 39 C7 EC 6F 42
C7D0: 03 F0 28 EE 02 D0 AD 02 5E
C7D8: D0 D0 08 AD 10 D0 09 02 1C
C7E0: 8D 10 D0 E8 AD 10 D0 29 EF
C7E8: 02 F0 10 A9 54 CD 02 D0 8A
C7F0: B0 09 20 07 CD AE 6F 03 C0
C7F8: 20 EA CE CC 70 03 F0 24 28
C800: AD 1E D0 CE 03 D0 88 A9 71
C808: 4A CD 03 D0 D0 09 20 EA D8
C810: CE 20 F5 CC 4C B9 C7 AD 3D
C818: 1F D0 29 02 F0 03 4C B2 26
C820: C9 4C CE C7 EC 6F 03 D0 FC
C828: EE 4C B9 C7 AE 37 03 CA 98
C830: DE 3C 03 BD 3C 03 30 03 7E
C838: 4C F7 C6 A9 01 9D 6B 03 F9
C840: 20 EE CD 20 49 C8 4C 61 FC
C848: C3 78 A9 31 8D 14 03 A9 AD
C850: EA 8D 15 03 58 60 AD 1E 65
C858: D0 20 F5 CC 20 EA CE AD 93
C860: 71 03 D0 08 AD 72 03 D0 A1
C868: 11 4C B9 C7 AD 6F 03 30 97
C870: 03 20 07 CD CE 6F 03 4C F5
C878: B9 C7 AD 6F 03 10 03 20 4D
C880: 07 CD EE 6F 03 4C B9 C7 84
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C888: AD 70 03 30 5B EC 6F 03 94
C890: F0 2A CE 02 D0 AD 02 D0 CD
C898: C9 FF D0 08 AD 10 D0 29 F2
C8A0: 01 8D 10 D0 CA AD 10 D0 69
C8A8: 29 02 D0 10 A9 19 CD 02 47
C8B0: D0 90 09 20 07 CD AE 6F 2E
C8B8: 03 20 EA CE CC 70 03 F0 C6
C8C0: 1F EE 03 D0 A9 FA CD 03 18
C8C8: D0 D0 03 4C 2C C8 C8 AD 25
C8D0: 1E D0 29 02 D0 80 AD 1F 09
C8D8: D0 29 02 D0 68 4C 8D C8 B0
C8E0: EC 6F 03 D0 EA 4C B9 C7 C9
C8E8: EC 6F 03 F0 2A CE 02 D0 05
C8F0: AD 02 D0 C9 FF D0 08 AD C1
C8F8: 10 D0 29 01 8D 10 D0 CA 3D
C900: AD 10 D0 29 02 D0 10 A9 44
C908: 19 CD 02 D0 90 09 20 07 82
C910: CD AE 6F 03 20 EA CE CC A5
C918: 70 03 F0 21 AD 1E D0 CE 09
C920: 03 D0 88 A9 4A CD 03 D0 12
C928: D0 09 20 EA CE 20 F5 CC BE
C930: 4C B9 C7 AD 1F D0 29 02 C6
C938: D0 43 4C E8 C8 EC 6F 03 A9
C940: D0 F1 4C B9 C7 AD 03 D0 52
C948: 38 E9 2E 4A 4A 8D 69 03 27
C950: 4A AA AD 10 D0 29 02 D0 CF
C958: 09 AD 02 D0 38 E9 18 4C 68
C960: 65 C9 AD 02 D0 4A 4A 4A EE
C968: 8D 64 03 4A 0A A8 AD 10 18
C970: D0 29 02 F0 05 98 18 69 7C
C978: 1C A8 4C C4 C9 AD 03 D0 99
C980: 38 E9 32 4A 4A 8D 69 03 63
C988: 4A 4C 51 C9 AD 03 D0 38 F3
C990: E9 2E 4A 4A 8D 69 03 4A 81
C998: AA AD 10 D0 29 02 D0 09 D6
C9A0: AD 02 D0 38 E9 14 4C AF 53
C9A8: C9 AD 02 D0 18 69 04 4C C4
C9B0: 65 C9 AD 03 D0 38 E9 32 B5
C9B8: 4A 4A 8D 69 03 4A 4C 98 76
C9C0: C9 4C 19 CB 8E 67 03 8C 41
C9C8: 68 03 A9 00 8D 73 03 18 F9
C9D0: 20 F0 FF AE 68 03 A4 D3 74
C9D8: B1 D1 C9 CF F0 E3 4C 38 4F
C9E0: CA A9 01 8D 73 03 AD 03 0B
C9E8: D0 38 E9 32 4A 4A 8D 69 99
C9F0: 03 4A AA 8E 67 03 AD 10 9F
C9F8: D0 29 02 D0 09 AD 02 D0 4F
CA00: 38 E9 18 4C 09 CA AD 02 0A
CA08: D0 4A 4A 4A 8D 64 03 4A F6
CA10: 0A A8 AD 10 D0 29 02 F0 6D
CA18: 05 98 18 69 1C A8 8C 68 F0
CA20: 03 4C CF C9 18 20 F0 FF 32
CA28: A4 D3 B1 D1 C9 CF F0 91 40
CA30: AD 73 03 F0 AC 4C 39 C7 3F
CA38: AD 64 03 29 01 D0 71 AD 67
CA40: 69 03 29 01 D0 3B 88 88 F3
CA48: CA CA 30 1E B1 D1 C9 CF 49
CA50: F0 23 8A A8 8C 6A 03 AE 40
CA58: 67 03 CA 18 20 F0 FF AE 65
CA60: 6A 03 A4 D3 B1 D1 C9 CF 63
CA68: F0 14 E8 E8 8A A8 AE 67 88
CA70: 03 CA 4C 24 CA 8A A8 AE 5B
CA78: 67 03 18 20 F0 FF 4C 19 71
CA80: CB 88 88 CA CA 30 1E B1 F2
CA88: D1 C9 CF F0 E8 8A A8 8C 8D
CA90: 6A 03 AE 67 03 E8 18 20 38
CA98: F0 FF AE 6A 03 A4 D3 B1 CF
CAA0: D1 C9 CF F0 74 E8 E8 8A CD
CAA8: A8 AE 67 03 E8 4C 24 CA 8E
CAB0: AD 69 03 29 01 D0 31 C8 BF
CAB8: C8 E8 E8 E0 29 B0 1E B1 DD
CAC0: D1 C9 CF F0 B0 8A A8 8C 8D
CAC8: 6A 03 AE 67 03 CA 18 20 52
CAD0: F0 FF AE 6A 03 A4 D3 B1 08
CAD8: D1 C9 CF F0 3C CA CA 8A 91
CAE0: A8 AE 67 03 CA 4C 24 CA A8
CAE8: C8 C8 E8 E8 E0 29 B0 1E 25
CAF0: B1 D1 C9 CF F0 7F 8A A8 B1
CAF8: 8C 6A 03 AE 67 03 E8 18 0D
CB00: 20 F0 FF AE 6A 03 A4 D3 A5
CB08: B1 D1 C9 CF F0 0B CA CA B6
CB10: 8A A8 AE 67 03 E8 4C 24 B5
CB18: CA A9 20 20 D2 FF A9 20 69
CB20: 20 D2 FF AD 1F D0 20 0F DF
CB28: CC 20 EA CE A0 06 AD 37 5A
CB30: 03 0A 0A 0A 38 ED 37 03 B1
CB38: AA CA FE 40 03 A9 3A DD B1
CB40: 40 03 F0 03 4C 58 CB A9 91
CB48: 30 9D 40 03 99 06 04 88 85
CB50: CA C0 FF D0 E5 4C 64 CB 0F
CB58: BD 40 03 99 06 04 CA 88 50
CB60: C0 FF D0 F4 AD 63 03 C9 C4
CB68: 63 D0 01 60 20 C3 CB CE 7C
CB70: 3A 03 AD 3A 03 C9 00 D0 33
CB78: 0A AD 3B 03 C9 00 D0 0D 16
CB80: 4C 43 C8 AD 3A 03 C9 FF 8D
CB88: D0 03 CE 3B 03 A2 01 A0 AD
CB90: 1F 18 20 F0 FF AE 3A 03 C4
CB98: AD 3B 03 20 CD BD A9 20 F9
CBA0: 20 D2 FF AD 63 03 C9 63 D4
CBA8: F0 03 4C B9 C7 60 A5 CB 3C
CBB0: C9 3C F0 0E C9 01 D0 03 54
CBB8: 4C 46 C7 AD 00 DC 29 10 D6
CBC0: D0 EC 60 AE 37 03 CA 8A 1D
CBC8: 0A 0A 0A 38 ED 37 03 AA F1
CBD0: E8 A0 00 B9 5C 03 DD 40 91
CBD8: 03 F0 04 B0 31 90 06 E8 32
CBE0: C8 C0 07 D0 EE AE 37 03 1A
CBE8: CA 8A 0A 0A 0A 38 ED 37 B9
CBF0: 03 AA E8 A0 00 BD 40 03 29
CBF8: 99 5C 03 E8 C8 C0 07 D0 3C
CC00: F4 A2 00 BD 5C 03 9D 1F 71
CC08: 04 E8 E0 07 D0 F5 60 20 24
CC10: 97 E0 A5 8D C9 10 B0 08 4E
CC18: A9 01 8D 6F 03 4C F5 CC D1
CC20: C9 20 B0 08 A9 FF 8D 6F 69
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 95 and 96 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
CC28: 03 4C F5 CC C9 30 B0 08 EC
CC30: A9 02 8D 6F 03 4C F5 CC EA
CC38: C9 40 B0 08 A9 FE 8D 6F A0
CC40: 03 4C F5 CC C9 50 B0 08 25
CC48: A9 03 8D 6F 03 4C F5 CC 04
CC50: C9 60 B0 08 A9 FD 8D 6F D7
CC58: 03 4C F5 CC C9 70 B0 08 5D
CC60: A9 00 8D 6F 03 4C F5 CC 19
CC68: C9 80 B0 08 A9 04 8D 6F 16
CC70: 03 4C F5 CC C9 90 B0 08 95
CC78: A9 FC 8D 6F 03 4C F5 CC 2E
CC80: C9 A0 B0 0D A9 01 8D 6F 50
CC88: 03 A9 02 8D 63 03 4C DF 57
CC90: CC C9 B0 B0 0D A9 FF 8D CC
CC98: 6F 03 A9 02 8D 63 03 4C F6
CCA0: DF CC C9 C0 B0 0D A9 01 40
CCA8: 8D 6F 03 A9 03 8D 63 03 49
CCB0: 4C DF CC C9 D0 B0 0D A9 AB
CCB8: FF 8D 6F 03 A9 03 8D 63 56
CCC0: 03 4C DF CC C9 E0 B0 0D 25
CCC8: A9 01 8D 6F 03 A9 04 8D AE
CCD0: 63 03 4C DF CC A9 FF 8D 67
CCD8: 6F 03 A9 04 8D 63 03 AD 9A
CCE0: 70 03 10 07 AD 63 03 8D 0D
CCE8: 70 03 60 A9 00 38 ED 63 EF
CCF0: 03 8D 70 03 60 AD 70 03 76
CCF8: 0A 8D 63 03 AD 70 03 38 50
CD00: ED 63 03 8D 70 03 60 AD 63
CD08: 6F 03 0A 8D 63 03 AD 6F 95
CD10: 03 38 ED 63 03 8D 6F 03 9F
CD18: 60 AD 8D 02 C9 01 F0 30 A1
CD20: AD 00 DC 29 04 D0 52 A9 A4
CD28: 01 8D 71 03 A9 00 8D 72 D4
CD30: 03 AD 10 D0 29 01 D0 23 DF
CD38: A2 00 AD 00 D0 CD 65 03 8F
CD40: F0 11 A9 01 8D 71 03 CE BD
CD48: 00 D0 E8 EC 66 03 D0 EA 14
CD50: 4C 31 EA A9 00 8D 71 03 64
CD58: 4C 31 EA A2 00 AD 00 D0 E1
CD60: F0 0C CE 00 D0 E8 EC 66 39
CD68: 03 D0 F2 4C 31 EA AD 10 55
CD70: D0 29 02 8D 10 D0 4C 62 89
CD78: CD A9 00 8D 71 03 AD 00 9F
CD80: DC 29 08 D0 4A A9 01 8D E1
CD88: 72 03 AD 10 D0 29 01 F0 A7
CD90: 1E A2 00 AD 00 D0 CD 35 D2
CD98: 03 F0 0C EE 00 D0 E8 EC 2E
CDA0: 66 03 D0 EF 4C 31 EA A9 DC
CDA8: 00 8D 72 03 4C 31 EA A2 B6
CDB0: 00 AD 00 D0 C9 FF F0 0C F5
CDB8: EE 00 D0 E8 EC 66 03 D0 88
CDC0: F0 4C 31 EA AD 10 D0 09 B1
CDC8: 01 8D 10 D0 4C B8 CD A9 B4
CDD0: 00 8D 72 03 4C 31 EA A5 E1
CDD8: CB C9 2F D0 03 4C 27 CD B2
CDE0: A9 00 8D 71 03 A5 CB C9 C7
CDE8: 2C D0 E4 4C 85 CD A2 0D 1A
CDF0: A0 01 18 20 F0 FF A2 00 5E
CDF8: BD 06 CE 20 D2 FF E8 E0 48
CE00: 26 D0 F5 4C 2C CE 6E B7 5A
CE08: 6D 20 20 AA B7 B4 20 20 0D
CE10: 6D 20 6E 20 20 62 B7 B7 1E
CE18: 20 20 20 6E B7 6D 20 20 4C
CE20: B4 20 AA 20 20 62 B7 B7 B1
CE28: 20 70 B7 6D A2 0E A0 01 30
CE30: 18 20 F0 FF A2 00 BD 44 FD
CE38: CE 20 D2 FF E8 E0 26 D0 BA
CE40: F5 4C 6A CE B4 20 AF 20 60
CE48: 20 68 63 67 20 20 B4 62 F2
CE50: AA 20 20 AB 63 20 20 20 AA
CE58: 20 B4 20 AA 20 20 62 20 BA
CE60: 62 20 20 AB 63 20 20 AA FC
CE68: AF 6E A2 0F A0 01 18 20 12
CE70: F0 FF A2 00 BD 82 CE 20 33
CE78: D2 FF E8 E0 26 D0 F5 4C 4E
CE80: A8 CE 6D AF 6E 20 20 67 2B
CE88: 20 68 20 20 B4 20 AA 20 F0
CE90: 20 62 AF AF 20 20 20 6D 40
CE98: AF 6E 20 20 AA AF B4 20 26
CEA0: 20 62 AF AF 20 AA 20 6D DA
CEA8: A2 11 A0 13 18 20 F0 FF 39
CEB0: A9 46 20 D2 FF A9 4F 20 AC
CEB8: D2 FF A9 52 20 D2 FF A2 1D
CEC0: 13 A0 11 18 20 F0 FF A2 51
CEC8: 00 BD D7 CE 20 D2 FF E8 09
CED0: E0 07 D0 F5 4C DE CE 50 C9
CED8: 4C 41 59 45 52 20 AE 37 5D
CEE0: 03 A9 00 20 CD BD 20 AE 08
CEE8: CB 60 A9 1A 8D 01 D4 A9 E5
CEF0: 09 8D 05 D4 A9 08 8D 06 A6
CEF8: D4 A9 11 8D 04 D4 A9 0F A7
CF00: 8D 18 D4 98 48 A0 00 C8 C4
CF08: D0 FD A9 10 8D 04 D4 68 5F
CF10: A8 60 19
```

BANNER
FROM PAGE 88

```
·100 PRINT CHR$(142):INPUT "[CLEAR]PRINT
 CHARACTER  [s V][3"[LEFT]"]";P$          BO
·105 INPUT "HEIGHT (1-9)  5[3"[LEFT]"]";H ID
·110 PRINT "WIDTH ";H;"[4"[LEFT]"]";:INPU
 T W:PRINT "DOWN OR SIDEWAYS (D/S)";      KD
·113 GET D$:IF D$<>"D" AND D$<>"S"THEN 11
 3                                        FP
·118 INPUT "[CLEAR]MESSAGE";M$            AB
·120 FOR X=1 TO -H*(D$="S")-W*(D$="D"):P$
 (0)=P$(0)+" ":P$(1)=P$(1)+P$:NEXT        PC
·125 CB=(PEEK(56578)AND3)*16384+(PEEK(532
 72)AND14)*1024                           HJ
·130 OPEN 4,4                             DG
```

```
·140 FOR X=1 TO LEN(M$):A=ASC(MID$(M$,X,1
 ))                                      NI
·150 A=A-161-33*(A<255)-64*(A<192)-32*(A<
 160)+32*(A<98)-64*(A<64)                EJ
·155 POKE 56334,PEEK(56334)AND254:POKE 1,
 PEEK(1)AND251                           BE
·160 FOR Y=0 TO 7:C(Y)=PEEK(CB+A*8+Y):NEX
 T                                       MM
·165 POKE 1,PEEK(1)OR4:POKE 56334,PEEK(56
 334)OR1:IF D$="D" THEN 200              EA
·170 FOR Y=7 TO 0 STEP -1:FOR W1=1 TO W/2
 :FOR Z=7+(C(7)=0) TO 0 STEP -1          OD
·180 PRINT#4,P$(ABS((C(Z)AND(2[UPARROW]Y)
 )=2[UPARROW]Y));:NEXT Z:PRINT#4:NEXT W1,
 Y,X:GOTO 220                            KK
·200 FOR Y=0 TO 7:FOR W1=1 TO H/2:PRINT#4
 ,TAB(40-W*4);:FOR Z=7 TO 0 STEP -1      HN
·210 PRINT#4,P$(ABS((C(Y)AND(2[UPARROW]Z)
 )=2[UPARROW]Z));:NEXT Z:PRINT#4:NEXT W1,
 Y,X                                     GG
·220 CLOSE 4:PRINT "ANOTHER BANNER (Y/N)?
 ":WAIT 198,1:GET A$:IF A$="Y" THEN RUN  AA
```

PROGRAMMER'S AID

FROM PAGE 87

```
·59999 END                               IC
·60000 PRINT"[CLEAR]"TAB(11)"[RVSON] PROG
 RAMMER'S AID [RVSOFF]"                  FC
·60002 PRINT"RUN60040":PRINT"[3" "][RVSON
 ]THIS PROVIDES A SCREEN LISTING"        DE
·60004 PRINT" [RVSON]SHOWING THE LINE NUM
 BERS OF THE"                            BN
·60006 PRINT" [RVSON]PROGRAM AND THEIR ME
 MORY LOCATIONS."                        MA
·60008 PRINT"RUN60060":PRINT"[3" "][RVSON
 ]THIS AUTOMATICALLY DELETES ALL"        AA
·60010 PRINT" [RVSON]LINES IN THE PROGRAM
  WHICH BEGIN WITH"                      EA
·60012 PRINT" [RVSON]REM OR A COLON."    EA
·60014 PRINT"RUN60070":PRINT"[3" "][RVSON
 ]THIS DELETES ALL LINES BETWEEN TWO "   JC
·60016 PRINT" [RVSON]LINE NUMBERS (INCLUS
 IVE), WHICH YOU"                        KF
·60018 PRINT" [RVSON]WILL BE ASKED TO ENT
 ER.":PRINT                              MG
·60020 PRINT"[3" "][RVSON]SUBROUTINES MAY
  BE ACTIVATED BY"                       CA
·60022 PRINT" [RVSON]PLACING THE CURSOR O
 N THE ABOVE LINES"                      OM
·60024 PRINT" [RVSON]AND HITTING RETURN.
  TO ERASE THE"                          LN
·60026 PRINT" [RVSON]ENTIRE SUBROUTINE, U
 SE THE DELETE LINE"                     PL
·60028 PRINT" [RVSON]WITH[RVSOFF] 5[4"9"]
  [RVSON]AS LOW LINE #,[RVSOFF] 60076 [RV
 SON]AS"                                 JM
·60030 PRINT" [RVSON]HIGH.  WHEN THE PROG
 RAM STOPS ENTER"                        EK
·60032 PRINT" [RVSON]'RUN60100' AND HIT R
 ETURN.";:END                            CH
·60040 DIMLX(500),NX(500):N=1:NX(N)=2049:
 PRINT"[CLEAR]READING PROGRAM[5"."]"     HP
·60042 NX(N+1)=PEEK(NX(N))+256*(PEEK(NX(N
 )+1))                                   KP
·60044 LX(N)=PEEK(NX(N)+2)+256*(PEEK(NX(N
 )+3))                                   OE
·60046 IFNX(N+1)=0THEN60050              FA
·60048 N=N+1:GOTO60042                   OH
·60050 GOSUB60058:FORI=1TON-1:PRINTLX(I);
 TAB(9);NX(I)                            NI
·60052 IFI/18=INT(I/18)THENGOSUB60056    HH
·60054 NEXTI:END                         IK
·60056 PRINT"ANY KEY TO CONTINUE";:POKE19
 8,0:WAIT198,1:GETZ$                     IB
·60058 PRINT"[CLEAR]LINE #[3" "]MEM LOC":
 PRINT"[6"[c T]"][3" "][7"[c T]"]":RETURN CM
·60060 PRINT"[CLEAR]READING PROGRAM[3"."]
 ":POKE251,(PEEK(43)):POKE252,(PEEK(44))  IC
·60062 V=256:PL=PEEK(251)+V*(PEEK(252)):L
 =PEEK(PL):H=PEEK(PL+1):IFPL=0THENEND    LJ
·60064 X=(PEEK(PL+4)):IFX<>143ANDX<>58THE
 NPOKE251,L:POKE252,H:GOTO60062          FG
·60066 LN=PEEK(PL+2)+V*(PEEK(PL+3)):PRINT
 "[CLEAR][DOWN][DOWN]";LN:PRINT"[DOWN]GOT
 O60062":POKE631,13                      NK
·60068 POKE632,13:POKE633,13:POKE198,3:PR
 INT"[HOME]";:END                        PB
·60070 PRINT"[CLEAR][RVSON]DELETE FROM[RV
 SOFF]":INPUT"LOW LINE #";BL:PRINT"TO":IN
 PUT"HIGH LINE #";EL                     BG
·60072 PRINT"[CLEAR]READING PROGRAM[5"."]
 "                                       EE
·60074 V=256:H%=BL/V:L%=BL-H%*V:POKE828,L
 %:POKE829,H%                            JO
·60076 H%=EL/V:L%=EL-H%*V:POKE830,L%:POKE
 831,H%:POKE832,PEEK(43):POKE833,PEEK(44) DN
·60086 V=256:BL=PEEK(828)+V*(PEEK(829)):E
 L=PEEK(830)+V*(PEEK(831))               DH
·60088 PL=PEEK(832)+V*(PEEK(833))        IP
·60090 NL=PEEK(PL)+V*(PEEK(PL+1)):LN=PEEK
 (PL+2)+V*(PEEK(PL+3))                   FN
·60092 IFLN<BLTHENPL=NL:GOTO60090        LE
·60094 IFLN>ELORLN=0THENEND              MM
·60096 H%=PL/256:L%=PL-256*H%:POKE832,L%:
 POKE833,H%:PRINT"[CLEAR][DOWN][DOWN]";LN DO
·60098 PRINT"[DOWN]RUN60086":FORI=631TO63
 3:POKEI,13:NEXTI:POKE198,3:PRINT"[HOME]"
 ;:END                                   FM
·60100 PRINT"[CLEAR]";:FORI=60086TO60102S
 TEP2:PRINTI:NEXT:POKE631,19:FORI=632TO64
 0                                       IH
·60102 POKEI,13:NEXT:POKE198,10:END      PE
```

AHOY!TERM 128
FROM PAGE 13

BASIC PORTION

```
·10 REM ******************************      NK
·11 REM **      AHOY! TERM 128      **      FA
·12 REM **       BY JEFF LIH        **      AC
·20 REM ******************************      NK
·30 BANK13                                  JA
·40 POKE 53280,0:POKE 53281,0:PRINTCHR$(1
 4)+"[WHITE]":POKE808,107                   HM
·50 IF PEEK(12288)=32GOTO130                OE
·60 PRINT"[CLEAR][DOWN][RIGHT][s A][DOWN]
 [RIGHT] [s H][DOWN][RIGHT] [s O][DOWN][R
 IGHT] [s Y][DOWN][RIGHT] ![DOWN][RIGHT]
 [s T][DOWN][RIGHT] [s E][DOWN][RIGHT] [s
  R][DOWN][RIGHT] [s M][DOWN][RIGHT]  [DO
 WN][RIGHT] 1[DOWN][RIGHT] 2[DOWN][RIGHT]
  8[DOWN]"                                  NC
·70 PRINT"[5"[UP]"][RIGHT][s D]ESIGNED BY
 : [s J]EFF [s L]IH"                        MJ
·80 PRINT"[RIGHT][s I]NITIALIZING - [s W]
 AIT[6"."]"                                 LE
·90 LOAD"TERM.ML",8,1                       KL
·100 REM                                    JD
·110 REM * * DEFAULT VALUES                 ND
·120 REM                                    JD
·130 OPEN 5,2,2,CHR$(0)+CHR$(0)+CHR$(65)+
 CHR$(1):POKE12294,25:REM 1200 BAUD         PJ
·140 OPEN 2,0,0:REM KEYBOARD                NE
·150 OPEN 3,3,0:REM SCREEN                  DG
·160 OPEN 4,4,7:REM PRINTER                 JM
·170 NI$="":NO$=""                          KG
·180 PRINT" [s P]LEASE ENTER [s U][s P][s
  L][s O][s A][s D] FILE NAME [s O][s R]"   GN
·190 INPUT" CARRIAGE RETURN FOR [s D][s E
 ][s F][s A][s U][s L][s T] ";NI$           OH
·200 GOSUB 1790                             GE
·210 REM N$="[3"5"]-1212":GOTO860           GB
·220 FORA=1TO999:NEXT:PRINT"[CLEAR]"+CHR$
 (14)+"[WHITE]"                             MF
·230 PRINT"  [RVSON] [s M][s A][s I][s N]
  [s M][s E][s N][s U] [RVSOFF][DOWN]"      LK
·240 PRINT" [s T] [s T]ERMINAL [s M]ODE[D
 OWN]"                                      IO
·250 PRINT" [s M] [s M]ODEM [s C]OMMANDS"   MC
·260 PRINT"[3" "]- [s D]IAL"                DN
·270 PRINT"[3" "]- [s H]ANG [s U]P/[s R]E
 SET [s B][s A][s U][s D]"                  PF
·280 PRINT"[3" "]- [s A]NSWER [s M]ODE[DO
 WN]"                                       PL
·290 PRINT" [s F] [s F]ILE [s C]OMMANDS"    GP
·300 PRINT"[3" "]- [s C]HANGE [s U][s P]/
 [s D][s O][s W][s N] [s L]OAD [s N]AMES"   GP
·310 PRINT"[3" "]- [s E]XAMINE/[s P]RINT
 [s F]ILES"                                 IO
·320 PRINT"[3" "]- [s R]ENAME [s F]ILES"    MH
```

```
·330 PRINT"[3" "]- [s S]CRATCH [s F]ILES[
 DOWN][DOWN]"                               JL
·340 PRINT" [s Q] [s Q]UIT [s P]ROGRAM[DO
 WN][DOWN]"                                 NN
·350 PRINT" [s R][s E][s P][s L][s Y] >[R
 VSON] [RVSOFF][LEFT]";                     BA
·360 GET#2,A$:IF A$=""THEN360               AB
·370 PRINTA$;                               EC
·380 IFA$="T"ORA$="[s T]"THENSYS12288:NO$
 ="":GOSUB1930:GOTO220                      HG
·390 IFA$="M"ORA$="[s M]"THENGOTO440        OM
·400 IFA$="F"ORA$="[s F]"THENGOTO1170       LP
·410 IFA$="Q"ORA$="[s Q]"THENGOTO1720       BE
·420 PRINT" HUH ??"                         JC
·430 FOR A=1TO999:NEXTA:GOTO220             EB
·440 REM MODEM SECTION                      CC
·450 PRINT"[CLEAR][DOWN]"                   IA
·460 PRINT"  [RVSON] [s M][s O][s D][s E]
 [s M] [s M][s E][s N][s U] [RVSOFF][DOWN
 ]"                                         HP
·470 PRINT" [s D] [s D][s I][s A][s L]"     AF
·480 PRINT" [s H] [s H]ANG [s U]P/[s R]ES
 ET [s B][s A][s U][s D]"                   HB
·490 PRINT" [s A] [s A]NSWER [s M]ODE"      OO
·500 PRINT" [s R] [s R]EPEAT [s L]AST [s
 M]ODEM [s C]OMMAND"                        LB
·510 PRINT"[3" "](USEFUL FOR REDIAL)"       FF
·520 PRINT" [s L] [s L]OCAL [s E]CHO[DOWN
 ]"                                         KO
·530 PRINT" [s X] [s E][s X][s I][s T] -
 [s R]ETURN TO [s M][s A][s I][s N] [s M]
 [s E][s N][s U][DOWN]"                     JI
·540 PRINT" [s R][s E][s P][s L][s Y] >[R
 VSON] [RVSOFF][LEFT]";                     BA
·550 GET#2,A$:IF A$=""THEN550               NM
·560 PRINTA$                                AD
·570 IFA$="D"ORA$="[s D]"GOTO650            AB
·580 IFA$="H"ORA$="[s H]"GOTO1020           BM
·590 IFA$="A"ORA$="[s A]"GOTO1160           BN
·600 IFA$="R"ORA$="[s R]"GOTO960            EJ
·610 IFA$="X"ORA$="[s X]"GOTO220            BG
·620 IFA$="[s L]"ORA$="L"GOTO970            EC
·630 PRINT" HUH ??"                         JC
·640 FOR A=1TO999:NEXT:GOTO450              AP
·650 PRINT"[DOWN] [s T]ELEPHONE [s N]UMBE
 R "                                        ML
·660 PRINT" [s N][s U][s M][s B][s E][s R
 ] >[RVSON] [RVSOFF][LEFT]";                NO
·670 N$=""                                  HC
·680 GET#2,A$:IF A$=""THEN680               AC
·690 IFA$=CHR$(13)THENGOTO860               MA
·700 IFA$="1"THENGOTO850                    PH
·710 IFA$="2"THENGOTO850                    NA
·720 IFA$="3"THENGOTO850                    BB
·730 IFA$="4"THENGOTO850                    AK
·740 IFA$="5"THENGOTO850                    AL
·750 IFA$="6"THENGOTO850                    PE
·760 IFA$="7"THENGOTO850                    PF
·770 IFA$="8"THENGOTO850                    AO
```

```
·780 IFA$="9"THENGOTO850                  PP
·790 IFA$="0"THENGOTO850                  MG
·800 IFA$=","THENGOTO850                  OC
·810 IFA$="#"THENGOTO850                  AB
·820 IFA$="*"THENGOTO850                  AI
·830 IFA$="-"THENGOTO850                  MD
·840 GOTO680                              CK
·850 N$=N$+A$:PRINTA$+"[RVSON] [RVSOFF][L
 EFT]";:GOTO680                           NM
·860 PRINT" "                             AD
·870 PRINT" [s O]KAY TO [s D][s I][s A][s
  L] - "N$" ?"                            AM
·880 INPUT"[DOWN] [s A]NSWER Y/N ";A$     CD
·890 IFA$="Y"ORA$="[s Y]"GOTO930          BO
·900 INPUT"[DOWN] [s T]RY [s A]GAIN ??  Y
 /N ";A$                                  OC
·910 IFA$="Y"ORA$="[s Y]"GOTO650          CB
·920 GOTO450                              CN
·930 PRINT#5,"[s A][s T] [s D][s T] "N$   DC
·940 PRINT" [s W][s A][s I][s T] [s F][s
 O][s R] [s C][s A][s R][s R][s I][s E][s
  R]"                                     IJ
·950 FORB=1TO999:NEXTB:GOTO220            CH
·960 PRINT#5,"[s A]/";:GOTO950            MN
·970 PRINT" [s E]NTER 1 FOR LOCAL ECHO ON
 "                                        BE
·980 INPUT" [s E]NTER 2 FOR LOCAL ECHO OF
 F";A$                                    GJ
·990 IFA$="1"THENPOKE12298,1:GOTO950      FD
·1000 IFA$="2"THENPOKE12298,0:GOTO950     DJ
·1010 GOTO630                             CJ
·1020 PRINT#5,"[3"+"]";                   PL
·1030 FORB=1TO999:NEXTB:PRINT#5,"[s V]"   AK
·1040 FORB=1TO999:NEXTB:CLOSE5            PE
·1050 PRINT" [s S]ET/[s R]ESET [s B][s A]
 [s U][s D] [s R]ATE"                     IF
·1060 INPUT"[DOWN] 300 OR 1200 ";A        MN
·1070 IFA=300GOTO1100                     FP
·1080 IFA=1200GOTO1130                    JE
·1090 PRINT" HUH ?":GOTO1060              OK
·1100 CLOSE5                              NH
·1110 OPEN5,2,3,CHR$(6):REM 300           FK
·1120 POKE12294,60:GOTO640                MM
·1130 CLOSE5                              NH
·1140 OPEN5,2,2,CHR$(0)+CHR$(0)+CHR$(65)+
 CHR$(1):REM 1200 BAUD                    PE
·1150 POKE12294,25:GOTO640                LF
·1160 PRINT#5,"[s A]";:GOTO950            KH
·1170 REM FILES SECTION                   CH
·1180 PRINT"[CLEAR][DOWN]"                IA
·1190 PRINT"  [RVSON] [s F][s I][s L][s E
 ][s S] [s M][s E][s N][s U] [RVSOFF][DOW
 N]"                                      HE
·1200 PRINT" $ [s D]ISPLAY [s D][s I][s R
 ][s E][s C][s T][s O][s R][s Y]"         II
·1210 PRINT" [s C] [s C]HANGE [s U][s P]/
 [s D][s O][s W][s N] [s L][s O][s A][s D
 ] [s F]ILE [s N]AMES"                    PF
·1220 PRINT" [s R] [s R]ENAME [s F]ILE"   OE
```

```
·1230 PRINT" [s S] [s S]CRATCH [s F]ILE"  FD
·1240 PRINT" [s V] [s D]ISPLAY ([s V]IEW)
  [s F]ILE"                               JB
·1250 PRINT" [s P] [s P]RINT [s F]ILE[DOW
 N]"                                      PN
·1260 PRINT" [s X] [s E][s X][s I][s T] -
  [s R]ETURN TO [s M][s A][s I][s N] [s M
 ][s E][s N][s U][DOWN]"                  JI
·1270 PRINT" [s R][s E][s P][s L][s Y] >[
 RVSON] [RVSOFF][LEFT]";                  BA
·1280 GET#2,A$:IFA$=""THEN1280            CL
·1290 PRINTA$                             AD
·1300 IFA$="$"THENGOTO1390                BF
·1310 IFA$="C"ORA$="[s C]"THENGOTO1420    BF
·1320 IFA$="R"ORA$="[s R]"THENGOTO1490    NM
·1330 IFA$="S"ORA$="[s S]"THENGOTO1570    BL
·1340 IFA$="V"ORA$="[s V]"THENGOTO1600    OB
·1350 IFA$="P"ORA$="[s P]"THENGOTO1610    PK
·1360 IFA$="X"ORA$="[s X]"THENGOTO220     NA
·1370 PRINT" HUH ??"                      JC
·1380 FOR A=1TO999:NEXT:GOTO1180          EI
·1390 CLOSE9:CLOSE8:CLOSE15               CF
·1400 PRINT"[DOWN] [s Y]OU [s M]AY [s C][
 s H][s A][s N][s G][s E] [s D]ISKS [s N]
 OW[DOWN]":GOSUB1880                      CJ
·1410 NEW:GOSUB1790:GOSUB1880:GOTO1180    FK
·1420 CLOSE8:CLOSE9:CLOSE15               DH
·1430 PRINT                               JJ
·1440 GOSUB 1450::GOTO1180                CL
·1450 PRINT"[DOWN] [s Y]OU [s M]AY [s C][
 s H][s A][s N][s G][s E] [s D]ISKS [s N]
 OW[DOWN]"                                LM
·1460 INPUT" [s E]NTER NEW [s U][s P][s L
 ][s O][s A][s D] [s F][s I][s L][s E] ";
 NI$                                      BJ
·1470 INPUT" [s E]NTER NEW [s D][s O][s W
 ][s N][s L][s O][s A][s D] [s F][s I][s
 L][s E] ";NO$                            MP
·1480 GOSUB1790:GOSUB1880:RETURN          OO
·1490 CLOSE8:CLOSE9:INPUT" [s E]NTER [s O
 ][s L][s D] [s F]ILE ";XN$               GG
·1500 INPUT" [s E]NTER [s N][s E][s W] [s
  F]ILE ";YN$                             FM
·1510 PRINT" [s C]HANGING "+XN$+" TO "+YN
 $                                        NP
·1520 INPUT " [s P]ROCEED (Y/N)";A$       GD
·1530 IF A$="[s Y]"ORA$="Y"THENGOTO1550   CB
·1540 GOTO 1560                           FJ
·1550 PRINT#15,"R:"+YN$+"="+XN$           DH
·1560 GOSUB1860:GOSUB1790:GOSUB1880:GOTO1
 180                                      EG
·1570 CLOSE8:CLOSE9                       OP
·1580 INPUT " [s E]NTER [s F]ILE TO [s S]
 [s C][s R][s A][s T][s C][s H]";NAM$     FJ
·1590 PRINT#15,"S0:"+NAM$:GOTO1560        LF
·1600 SW$="S":GOTO1620                    MF
·1610 SW$="P"                             CJ
·1620 INPUT" [s E]NTER [s F][s I][s L][s
 E] [s N]AME ";NAM$                       CN
```

```
·1630 PRINT" [s H]IT [s A]NY [s K]EY TO [
 s S][s T][s O][s P]"                       CO
·1640 CLOSE8:CLOSE9                         OP
·1650 OPEN 7,8,7,"0:"+NAM$+",S,R"           HH
·1660 GOSUB1860                             GA
·1670 IFSW$="P"THENGOTO1700                 IL
·1680 GET#7,A$:IFST=0THENPRINTA$;:GET#2,B
 $:IFB$=""THENGOTO1680                      LA
·1690 GOTO1710                              FA
·1700 GET#7,A$:IFST=0THENPRINT#4,A$;:GET#
 2,B$:IFB$=""THENGOTO1700                   EH
·1710 PRINT:CLOSE7:GOSUB1790:GOSUB1880:GO
 TO1180                                     GD
·1720 CLOSE9:CLOSE8:CLOSE4:PRINT#15,"I"     OB
·1730 PRINT#5,"[3"+"]";                     PL
·1740 FORB=1TO999:NEXTB:PRINT#5,"[s V]"     AK
·1750 FORB=1TO999:NEXTB:CLOSE5              PE
·1760 CLOSE5:CLOSE15                        BF
·1770 PRINT"[CLEAR]":POKE808,110            JF
·1780 END                                   IC
·1790 CLOSE15:OPEN15,8,15:PRINT#15,"I"      AD
·1800 IFNI$=""THENNI$="ZZUP":NAM$=NI$:GOS
 UB1920                                     DL
·1810 IFNO$=""THENNO$="ZZDOWN":NAM$=NO$:G
 OSUB1920                                   EB
·1820 OPEN 8,8,8,"0:"+NI$+",S,R"            JB
·1830 GOSUB1860                             GA
·1840 IFE1$<>"00"THENCLOSE8:OPEN8,8,8,"@0
 :"+NI$+",S,W":CLOSE8:GOTO1820              AA
·1850 OPEN 9,8,9,"@0:"+NO$+",S,W":RETURN    OM
·1860 INPUT#15,E1$,E2$,E3$,E4$              HL
·1870 PRINT:PRINTE1$;" ";E2$;" ";E3$;" ";
 E4$:RETURN                                 JC
·1880 PRINT:PRINT"[DOWN] [RVSON][s H]IT A
 NY KEY TO CONTINUE[RVSOFF]":PRINT          MF
·1890 GET#2,A$:IF A$=""THEN1890             EO
·1900 RETURN                                IM
·1910 NI$="ZZUP":NO$="ZZDOWN":PRINT         BG
·1920 PRINT" [s U]SING [s D][s E][s F][s
 A][s U][s L][s T] FILENAME ";NAM$:RETURN IK
·1930 PRINT:PRINT" [s I]F YOU HAVE [s S][
 s A][s V][s E][s D] [s D][s O][s W][s N]
  [s L][s O][s A][s D] DATA  "              HJ
·1940 PRINT" [s P]LEASE RENAME [RVSON]ZZD
 OWN[RVSOFF] FILE IMMEDIATLY"               PC
·1950 PRINT" IF YOU WANT TO KEEP IT"        BE
·1960 GOSUB1880:RETURN                      DL
```

ML PORTION (Beg. Address: 3000/Ending Address: 3B00)

```
3000: 20 6F 32 4C 0C 30 19 02 65
3008: 50 01 00 36 20 CC FF A2 1F
3010: 05 20 C6 FF A9 00 20 E4 AA
3018: FF C9 00 D0 06 20 B1 30 BA
```

All the programs in this issue of Ahoy! are available on disk or cassette. See page 53 for details.

```
3020: 4C 0C 30 AA BD 00 38 8D D6
3028: 9D 31 EE BD 32 AC BD 32 72
3030: C0 28 F0 07 C0 51 F0 03 17
3038: 4C 3E 30 20 A9 32 AD 9D 3A
3040: 31 C9 0A D0 03 4C 0C 30 A1
3048: 20 CC FF A2 03 20 C9 FF C4
3050: AD 9D 31 AC 66 34 C0 01 D5
3058: D0 35 20 68 34 EE 69 34 A7
3060: D0 2D EE 6A 34 AC 61 34 2E
3068: CC 6A 34 D0 22 20 A9 32 C2
3070: 20 A9 32 A2 09 20 C9 FF 02
3078: 20 E3 35 AD 63 34 8D 69 ED
3080: 34 AD 64 34 8D 6A 34 20 47
3088: CC FF A2 03 20 C9 FF AD 92
3090: 9D 31 20 D2 FF AD 9D 31 CE
3098: C9 22 D0 12 20 D2 FF A9 04
30A0: 9D 20 D2 FF A9 20 20 D2 ED
30A8: FF A9 9D 20 D2 FF 4C 0C 3B
30B0: 30 20 CC FF A9 00 8D BD C2
30B8: 32 20 A0 31 AC BE 32 C0 3B
30C0: 13 D0 03 20 BF 32 20 9F 79
30C8: FF A9 00 20 E0 37 8D 9D D5
30D0: 31 C9 00 D0 17 AC 66 34 FA
30D8: C0 02 F0 03 4C 93 31 20 C0
30E0: 51 31 8D 9D 31 C9 00 D0 5A
30E8: 03 4C 93 31 C9 BD D0 03 58
30F0: 4C 8B 32 C9 BF D0 03 4C A4
30F8: 70 34 C9 AE D0 0B 20 A9 BB
3100: 32 20 A9 32 A0 00 8C BE 1A
3108: 32 8D 0B 30 AA BD 00 39 A4
3110: 8D 9D 31 20 7B 31 AD 0A F0
3118: 30 F0 0E 20 CC FF A2 03 D9
3120: 20 C9 FF AD 0B 30 20 D2 E5
3128: FF 20 CC FF A2 05 20 C9 A6
3130: FF AD 9D 31 20 3D 31 20 5B
3138: D2 FF 4C 93 31 C9 0D D0 C3
3140: 0F AC 66 34 C0 02 D0 08 32
3148: A9 20 20 D2 FF AD 9D 31 81
3150: 60 20 6C 34 EE 6D 34 D0 D2
3158: 03 EE 6E 34 AC 6E 34 CC 09
3160: 6A 34 D0 0D AC 6D 34 CC F7
3168: 69 34 D0 05 A0 00 8C 66 6F
3170: 34 AC 06 30 8C 9E 31 8C 70
3178: 9F 31 60 AE 9E 31 CA 8E 81
3180: 9E 31 D0 F7 AE 08 30 8E 8E
3188: 9E 31 AE 9F 31 CA 8E 9F D0
3190: 31 D0 E8 AE 08 30 8E 9E 8F
3198: 31 8E 9F 31 60 BD 50 50 E7
31A0: A2 03 20 C9 FF A2 00 BD 90
31A8: B6 31 20 D2 FF E8 E0 08 55
31B0: D0 F5 20 CC FF 60 05 0E D7
31B8: 12 20 92 9D 20 9D 93 05 71
31C0: 0E 0D 0D 20 D4 C5 D2 CD 44
31C8: C9 CE C1 CC 20 2D 20 C1 1F
31D0: C3 D4 C9 D6 C5 20 0D 20 1D
31D8: 50 52 45 53 53 20 C3 3D 88
31E0: D8 20 54 4F 20 45 58 49 84
31E8: 54 20 54 4F 20 CD C1 C9 7A
31F0: CE 20 CD C5 CE D5 20 0D 45
```

```
31F8: 20 50 52 45 53 53 20 C3 8B
3200: 3D C2 20 46 4F 52 20 C2 EA
3208: D5 C6 C6 C5 D2 20 4D 45 B6
3210: 4E 55 0D 20 50 52 45 53 1C
3218: 53 20 C3 3D D3 20 46 4F 16
3220: 52 20 D0 C1 D5 D3 C5 20 B4
3228: 28 53 45 4E 44 53 20 C3 B2
3230: CE D4 D2 CC 2D D3 29 0D AA
3238: 20 28 53 45 4E 44 20 C3 8F
3240: CE D4 D2 CC 20 D1 20 54 E9
3248: 4F 20 43 4F 4E 54 49 4E 84
3250: 55 45 29 0D 00 0E 0D 0D 49
3258: 20 D4 C5 D2 CD C9 CE C1 0E
3260: CC 20 2D 20 C9 CE C1 C3 B8
3268: D4 C9 D6 C5 20 0D 00 20 F0
3270: CC FF A2 03 20 C9 FF A2 6F
3278: 00 BD BE 31 C9 00 F0 07 E7
3280: 20 D2 FF E8 4C 79 32 20 74
3288: CC FF 60 20 A9 32 A2 03 57
3290: 20 C9 FF A2 00 BD 55 32 62
3298: C9 00 F0 07 20 D2 FF E8 36
32A0: 4C 95 32 20 CC FF 68 68 72
32A8: 60 20 CC FF A2 05 20 C9 87
32B0: FF A9 13 8D BE 32 20 D2 DE
32B8: FF 20 CC FF 60 00 13 20 39
32C0: CC FF A2 05 20 C9 FF A9 C8
32C8: 11 8D BE 32 20 D2 FF 20 6B
32D0: CC FF 60 0E 05 93 0D 20 D1
32D8: 12 20 C2 D5 C6 C6 C5 D2 C9
32E0: 20 CD C5 CE D5 20 92 0D F8
32E8: 0D 20 CC 20 2D 20 CC CF EC
32F0: C1 C4 20 42 55 46 46 45 01
32F8: 52 20 46 52 4F 4D 20 44 05
3300: 49 53 4B 0D 20 D3 20 2D 36
3308: 20 D3 C1 D6 C5 20 42 55 12
3310: 46 46 45 52 20 54 4F 20 18
3318: 44 49 53 4B 0D 20 D6 20 68
3320: 2D 20 D6 C9 C5 D7 20 42 0E
3328: 55 46 46 45 52 20 4F 4E 5F
3330: 20 53 43 52 45 45 4E 0D 1F
3338: 00 00 20 D0 20 2D 20 D0 67
3340: D2 C9 CE D4 20 42 55 46 7E
3348: 46 45 52 20 4F 4E 20 50 54
3350: 52 49 4E 54 45 52 0D 20 53
3358: D2 20 2D 20 D2 C5 D3 C5 CA
3360: D4 20 28 C3 CC C5 C1 D2 68
3368: 29 20 42 55 46 46 45 52 6D
3370: 0D 20 CF 20 2D 20 53 45 73
3378: 54 20 43 41 50 54 55 52 BD
3380: 45 20 4F 4E 20 28 CF D0 6C
3388: C5 CE 29 0D 20 C3 20 2D 84
3390: 20 53 45 54 20 43 41 50 92
3398: 54 55 52 45 20 4F 46 46 D5
33A0: 20 28 C3 CC CF D3 C5 29 0C
33A8: 0D 20 D4 20 2D 20 D4 D2 BF
33B0: C1 CE D3 CD C9 D4 20 42 E3
33B8: 55 46 46 45 52 20 28 D3 4E
33C0: C5 CE C4 29 0D 0D 20 D8 56
33C8: 20 2D 20 C5 D8 C9 D4 20 93
```

```
33D0: 28 52 45 54 55 52 4E 20 FA
33D8: 54 4F 20 54 45 52 4D 49 1F
33E0: 4E 41 4C 20 4D 4F 44 45 03
33E8: 29 0D 00 00 20 20 20 20 9F
33F0: 20 20 28 42 55 46 46 45 C2
33F8: 52 20 49 53 20 CF D0 C5 8E
3400: CE 29 0D 00 00 20 20 20 65
3408: 20 20 20 28 42 55 46 46 B4
3410: 45 52 20 49 53 20 53 45 1D
3418: 54 20 46 4F 52 20 D8 CD 3B
3420: C9 D4 29 0D 00 00 20 20 35
3428: 20 20 20 20 28 42 55 46 AE
3430: 46 45 52 20 49 53 20 C3 AE
3438: CC CF D3 C5 C4 29 0D 00 69
3440: 00 20 20 20 20 20 20 28 29
3448: 00 00 20 46 49 4C 4C 45 D5
3450: 44 20 00 00 20 52 45 4D B9
3458: 41 49 4E 29 20 0D 00 00 87
3460: 00 80 01 00 3B 05 00 00 22
3468: 8D 00 3B 60 AD 00 3B 60 DA
3470: 20 A9 32 20 A9 32 A2 03 0E
3478: 20 C9 FF A2 00 BD D3 32 C8
3480: C9 00 F0 07 20 D2 FF E8 1E
3488: 4C 7D 34 A2 00 BD 3A 33 54
3490: C9 00 F0 07 20 D2 FF E8 2E
3498: 4C 8D 34 AD 66 34 C9 00 B8
34A0: F0 08 C9 01 F0 14 C9 02 35
34A8: F0 20 A2 00 BD 26 34 C9 3E
34B0: 00 F0 27 20 D2 FF E8 4C F0
34B8: AC 34 A2 00 BD EC 33 C9 E3
34C0: 00 F0 17 20 D2 FF E8 4C F0
34C8: BC 34 A2 00 BD 05 34 C9 1D
34D0: 00 F0 07 20 D2 FF E8 4C F0
34D8: CC 34 A2 00 BD 41 34 C9 79
34E0: 00 F0 07 20 D2 FF E8 4C 01
34E8: DC 34 38 AD 69 34 ED 63 CE
34F0: 34 8D 64 36 AD 6A 34 ED 87
34F8: 64 34 8D 65 36 20 67 36 78
3500: A2 00 BD 4A 34 C9 00 F0 99
3508: 07 20 D2 FF E8 4C 02 35 6E
3510: 38 AD 60 34 ED 69 34 8D A3
3518: 64 36 AD 61 34 ED 6A 34 82
3520: 8D 65 36 20 67 36 A2 00 A9
3528: BD 54 34 C9 00 F0 07 20 50
3530: D2 FF E8 4C 28 35 A9 00 3F
3538: 20 9F FF 20 E4 FF C9 00 C6
3540: F0 F4 09 80 C9 D8 D0 03 26
3548: 4C D9 35 C9 CC F0 1F C9 14
3550: D3 F0 29 C9 D6 F0 33 C9 CC
3558: D0 F0 3D C9 D2 F0 47 C9 F5
3560: CF F0 52 C9 C3 F0 56 C9 12
3568: D4 F0 5A 4C 70 34 20 CC 66
3570: FF A2 08 20 C6 FF 20 39 5B
3578: 36 4C 70 34 20 CC FF A2 2F
3580: 09 20 C9 FF 20 E3 35 4C F8
3588: 70 34 20 CC FF A2 03 20 DF
3590: C9 FF 20 E3 35 4C 70 34 84
3598: 20 CC FF A2 04 20 C9 FF 16
35A0: 20 E3 35 4C 70 34 AD 63 DB
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 95 and 96 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
35A8: 34 8D 69 34 AD 64 34 8D DB
35B0: 6A 34 4C 70 34 A9 01 8D 78
35B8: 66 34 4C 70 34 A9 00 8D 7B
35C0: 66 34 4C 70 34 A9 02 8D 85
35C8: 66 34 AD 63 34 8D 6D 34 D7
35D0: AD 64 34 8D 6E 34 4C 70 04
35D8: 34 20 CC FF 20 BF 32 20 2C
35E0: 6F 32 60 AD 63 34 8D 01 B6
35E8: 36 AD 64 34 8D 02 36 AD D8
35F0: 69 34 CD 63 34 D0 09 AD 7B
35F8: 6A 34 CD 64 34 D0 01 60 30
3600: AD 63 34 20 D2 FF A9 00 E1
3608: 20 9F FF 20 E4 FF 09 80 56
3610: C9 BF F0 18 EE 01 36 D0 99
3618: 03 EE 02 36 AC 02 36 CC F3
3620: 6A 34 D0 DC AC 01 36 CC 1D
3628: 69 34 D0 D4 20 7B 31 20 58
3630: 7B 31 20 7B 31 20 7B 31 76
3638: 60 A9 00 20 CF FF 8D 9D 5D
3640: 31 A9 00 20 B7 FF 29 40 5C
3648: D0 16 AD 9D 31 20 68 34 68
3650: EE 69 34 D0 E4 EE 6A 34 20
3658: AC 61 34 CC 6A 34 D0 D9 B0
3660: 60 4C 67 36 00 45 14 A2 A6
3668: 00 A9 00 9D 86 37 E8 E0 37
3670: 06 D0 F6 AD 64 36 29 01 B0
3678: F0 05 A0 04 20 37 37 AD 4F
3680: 64 36 29 02 F0 05 A0 09 E5
3688: 20 37 37 AD 64 36 29 04 8C
3690: F0 05 A0 0E 20 37 37 AD 71
3698: 64 36 29 08 F0 05 A0 13 0E
36A0: 20 37 37 AD 64 36 29 10 B0
36A8: F0 05 A0 18 20 37 37 AD 93
36B0: 64 36 29 20 F0 05 A0 1D 48
36B8: 20 37 37 AD 64 36 29 40 F8
36C0: F0 05 A0 22 20 37 37 AD B5
36C8: 64 36 29 80 F0 05 A0 27 CA
36D0: 20 37 37 AD 65 36 29 01 D2
36D8: F0 05 A0 2C 20 37 37 AD D7
36E0: 65 36 29 02 F0 05 A0 31 6F
36E8: 20 37 37 AD 65 36 29 04 ED
36F0: F0 05 A0 36 20 37 37 AD F9
36F8: 65 36 29 08 F0 05 A0 3B 97
3700: 20 37 37 AD 65 36 29 10 11
3708: F0 05 A0 40 20 37 37 AD 1B
3710: 65 36 29 20 F0 05 A0 45 D0
3718: 20 37 37 AD 65 36 29 40 59
3720: F0 05 A0 4A 20 37 37 AD 3D
3728: 65 36 29 80 F0 05 A0 4F 53
3730: 20 37 37 20 76 37 60 A2 8F
3738: 05 20 43 37 CA 88 E0 00 0C
3740: D0 F7 60 18 A9 0A 8D 66 29
3748: 36 BD 86 37 79 8C 37 9D D4
3750: 86 37 BD 86 37 CD 66 36 F3
3758: F0 0D EE 66 36 AD 66 36 2C
3760: C9 14 D0 EE 4C 75 37 BD B4
3768: 86 37 38 E9 0A 9D 86 37 AD
3770: CA FE 86 37 E8 60 A2 01 E4
3778: BD 86 37 09 30 20 D2 FF 20
3780: E8 E0 06 D0 F3 60 00 01 76
3788: 07 06 06 04 00 00 00 00 9F
3790: 01 00 00 00 00 02 00 00 93
3798: 00 00 04 00 00 00 00 08 A4
37A0: 00 00 00 01 06 00 00 00 A7
37A8: 03 02 00 00 00 06 04 00 B7
37B0: 00 01 02 08 00 00 02 05 C2
37B8: 06 00 00 05 01 02 00 01 C7
37C0: 00 02 04 00 02 00 04 08 D4
37C8: 00 04 00 09 06 00 08 01 E4
37D0: 09 02 01 06 03 08 04 03 F4
37D8: 02 07 06 08 00 00 00 00 EF
37E0: 20 E4 FF CD FF 37 F0 04 DF
37E8: 8D FF 37 60 A9 00 60 00 18
37F0: 00 00 00 00 00 00 00 00 F0
37F8: 00 00 00 00 00 00 00 BD B6
3800: 00 5C 02 89 04 05 06 07 FD
3808: 14 09 0A 0B 0C 0D 0E 0F 70
3810: 92 86 12 8A 00 15 16 17 08
3818: 18 19 1A 1B 1C 1D 1E 1F F4
3820: 20 21 22 23 24 25 26 27 3D
3828: 28 29 2A 2B 2C 2D 2E 2F 85
3830: 30 31 32 33 34 35 36 37 CD
3838: 38 39 3A 3B 3C 3D 3E 3F 16
3840: 40 C1 C2 C3 C4 C5 C6 C7 E1
3848: C8 C9 CA CB CC CD CE CF AA
3850: D0 D1 D2 D3 D4 D5 D6 D7 F2
3858: D8 D9 DA 5B 00 5D 5E 5F 5C
3860: 00 41 42 43 44 45 46 47 3E
3868: 48 49 4A 4B 4C 4D 4E 4F C6
3870: 50 51 52 53 54 55 56 57 0F
3878: 58 59 5A 00 00 00 00 00 84
3880: 00 5C 02 89 04 05 06 07 7E
3888: 14 09 0A 0B 0C 0D 0E 0F F0
3890: 92 86 12 8A 00 15 16 17 88
3898: 18 19 1A 1B 1C 1D 1E 1F 75
38A0: 20 21 22 23 24 25 26 27 BD
38A8: 28 29 2A 2B 2C 2D 2E 2F 06
38B0: 30 31 32 33 34 35 36 37 4E
38B8: 38 39 3A 3B 3C 3D 3E 3F 96
38C0: 40 C1 C2 C3 C4 C5 C6 C7 62
38C8: C8 C9 CA CB CC CD CE CF 2B
38D0: D0 D1 D2 D3 D4 D5 D6 D7 73
38D8: D8 D9 DA 5B 00 5D 5E 5F DC
38E0: 00 41 42 43 44 45 46 47 BE
38E8: 48 49 4A 4B 4C 4D 4E 4F 47
38F0: 50 51 52 53 54 55 56 57 8F
38F8: 58 59 5A 00 00 00 00 00 05
3900: 00 01 02 03 04 05 06 07 1C
3908: 08 09 0A 0B 0C 0D 0E 0F 64
3910: 10 11 12 13 08 15 16 17 A0
3918: 18 19 1A 1B 1C 1D 1E 1F F4
3920: 20 21 22 23 24 25 26 27 3D
3928: 28 29 2A 2B 2C 2D 2E 2F 85
3930: 30 31 32 33 34 35 36 37 CD
3938: 38 39 3A 3B 3C 3D 3E 3F 16
3940: 40 61 62 63 64 65 66 67 3F
3948: 68 69 6A 6B 6C 6D 6E 6F A7
3950: 70 71 72 73 74 75 76 77 EF
```

```
3958: 78 79 7A 5B 01 5D 5E 5F 3C
3960: 00 00 00 00 00 00 00 00 60
3968: 00 00 00 00 00 00 00 00 68
3970: 00 00 00 00 00 00 00 00 70
3978: 00 00 00 00 00 00 00 00 78
3980: 00 00 00 00 00 10 11 00 A1
3988: 00 03 13 00 00 00 00 00 9E
3990: 00 00 10 00 00 00 00 00 A0
3998: 00 00 00 00 00 00 00 00 98
39A0: 00 00 00 00 00 00 00 00 A0
39A8: 00 00 00 00 00 00 00 00 A8
39B0: 00 00 00 00 00 00 00 00 B0
39B8: 00 00 00 00 00 00 00 00 B8
39C0: 00 41 42 43 44 45 46 47 9E
39C8: 48 49 4A 4B 4C 4D 4E 4F 27
39D0: 50 51 52 53 54 55 56 57 6F
39D8: 58 59 5A 00 00 00 00 00 E4
39E0: 00 00 00 00 00 00 00 00 E0
39E8: 00 00 00 00 00 00 00 00 E8
39F0: 00 00 00 00 00 00 00 00 F0
39F8: 00 00 00 00 00 00 00 00 F8
3A00: 46 46 45 52 20 46 52 4F 2C
3A08: 4D 20 44 49 53 4B 22 00 C3
3A10: 1D 3A D6 0B 2E 42 59 54 67
3A18: 45 20 31 33 00 42 3A E0 3F
3A20: 0B 2E 42 59 54 45 20 22 D0
3A28: 20 D3 20 2D 20 D3 C1 D6 F5
3A30: C5 20 42 55 46 46 45 52 D1
3A38: 20 54 4F 20 44 49 53 4B 48
3A40: 22 00 4F 3A EA 0B 2E 42 52
3A48: 59 54 45 20 31 33 00 76 36
3A50: 3A F4 0B 2E 42 59 54 45 ED
3A58: 20 22 20 D6 20 2D 20 D6 D5
3A60: C9 C5 D7 20 42 55 46 46 0C
3A68: 45 52 20 4F 4E 20 53 43 74
3A70: 52 45 45 4E 22 00 87 3A 7F
3A78: FE 0B 2E 42 59 54 45 20 06
3A80: 31 33 20 30 20 30 00 B9 3F
3A88: 3A 08 0C 42 55 46 46 53 4E
3A90: 43 52 32 20 2E 42 59 54 96
3A98: 45 20 22 20 D0 20 2D 20 7E
3AA0: D0 D2 C9 CE D4 20 42 55 69
3AA8: 46 46 45 52 20 4F 4E 20 AA
3AB0: 50 52 49 4E 54 45 52 22 F8
3AB8: 00 C6 3A 12 0C 2E 42 59 A1
3AC0: 54 45 20 31 33 00 EC 3A 06
3AC8: 1C 0C 2E 42 59 54 45 20 74
3AD0: 22 20 D2 20 2D 20 D2 C5 EB
3AD8: D3 C5 D4 20 28 C3 CC C5 E5
3AE0: C1 D2 29 20 42 55 46 46 E2
3AE8: 45 52 22 00 F9 3A 26 0C 09
3AF0: 2E 42 59 54 45 20 31 33 D8
3AF8: 00 20 3B 30 0C 2E 42 59 5A
3B00: 54 54
```

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...at 718-383-8909 for information on upcoming issues, late-breaking news, program corrections, electronic mail, and more!

THE MOST AND THE LEAST FROM PAGE 18

QUIZ MAKER

```
·1 REM *** QUIZ MAKER ***                 DN
·2 REM USE THIS TO GENERATE QUIZ DATA FIL
ES FOR "THE MOST AND THE LEAST"           GK
·3 REM (IN DIRECT MODE, TYPE 'POKE 53265,
PEEK(53265)OR 64' TO MAKE SHIFTED         AB
·4 REM CHARACTERS SHOW UP WHEN TYPING THE
M IN                                      MN
·8 REM ** OPEN QUIZ FILE                  LL
·9 REM * CHANGE THE NAME FOR EACH NEW QUI
Z FILE YOU CREATE                         DD
·10 FF$="QUIZ MATRIX"                     PB
·11 FF$="@0:Q "+LEFT$(FF$,14)+",S,W"      BP
·12 OPEN 2,8,2,FF$                        HL
·14 REM * PREPARE CARRIAGE RETURN VARIABL
E                                         AL
·15 Z$=CHR$(13)                           LF
·16 REM * SELECT EXTENDED BACKGROUND COLO
R MODE                                    MF
·17 POKE 53265,PEEK(53265)OR 64           AM
·18 REM ** READ QUIZ DATA AND PRINT IT TO
 FILE                                     NP
·19 REM * HOW MANY QUIZZES?               CO
·20 NQ=2:PRINT#2,NQ                       GC
·28 REM ** MAIN LOOP FOR ALL QUIZZES **   CJ
·29 REM * READ TOTAL NUMBER OF ENTRIES IN
 THIS QUIZ                                NE
·30 FOR I=1 TO NQ:READ TN:PRINT#2,TN      GB
·31 REM * COLORS FOR BACKGROUNDS 0-3      FN
·32 FOR J=0 TO 3:READ A:PRINT#2,A:POKE 53
281+J,A:NEXT:POKE 53280,PEEK(53281)       GC
·33 REM * COLORS FOR FOREGROUNDS 0-3      EE
·34 FOR J=0 TO 3:READ FC$(J):PRINT#2,FC$(
 J):NEXT                                  LH
·35 REM * QUIZ TITLE LINE & FORMAT/INSTRU
 CTION LINE                               LM
·36 READ A$,B$:A$=FC$(3)+A$:B$=FC$(0)+B$:
PRINT#2,A$Z$B$:PRINT"[CLEAR]"A$:PRINT B$ AM
·37 REM * COLUMN HEADERS                  JK
·38 READ A$,B$:A$=FC$(1)+A$:B$=FC$(1)+B$:
PRINT#2,A$Z$B$:PRINT A$B$                 AC
·39 REM ** LOOP FOR EACH QUIZ **          OJ
·40 FOR J=1 TO TN                         OH
·41 REM * GET ENTRY & FACT (1ST ENTRY=HEA
DINGS, NOT COUNTED IN TOTAL NUMBER)       PP
·42 READ A$,B$:C$="":A$=" "+A$:FOR K=1 TO
 LEN(B$):A=ASC(MID$(B$,K,1))              MD
·43 REM * CONVERT FACT TO SHIFTED/REVERSE
D CHARACTERS                              PB
·44 IF A<32 OR A>95 THEN A=160:GOTO 47    LA
·45 IF A>63 THEN A=A+32:GOTO 47           PP
·46 A=A+128                               HG
·47 C$=C$+CHR$(A):NEXT:B$="[RVSON][SS]"+C
$+"[RVSOFF]"                              OK
·48 REM * PRINT STRINGS TO SCREEN AND FIL
```

```
 E FF$                                       MB
·49 PRINT#2,A$Z$B$:PRINT "[RVSON]"FC$(2)A
 $"[RVSOFF]"FC$(3)B$:NEXT:NEXT               JN
·50 CLOSE 2:PRINT "[HOME]";:END              BM
·97 REM *** DATA FOR QUIZZES ***             CD
·98 REM ** QUIZ #1                           HE
·99 REM * NUMBER OF ENTRIES, SCREEN COLOR
 S, FOREGROUND COLORS                        KL
·100 DATA 10,0,4,7,8,"[c 7]","[BLACK]","[
 c 7]","[WHITE]"                             PI
·101 REM * QUIZ TITLE (INCLUDE 39 SHIFTED
  CHARACTERS, PLUS REVERSE ON/OFF)           MJ
·102 DATA "[RVSON][12"[SS]"][s F][s I][s
 R][s S][s T][SS][s T][s E][s S][s T][SS]
 [s Q][s U][s I][s Z][12"[SS]"][RVSOFF]"     BC
·103 REM * FORMAT/INFORMATION LINE (39 UN
 SHIFTED CHARACTERS, NOT REVERSED)           MK
·104 DATA "[4" "]JUST SO YOU CAN SEE HOW
 IT WORKS[3" "]"                             FC
·105 REM * COLUMN HEADER FOR ENTRIES (21
 SHIFTED CHARACTERS)                         HE
·106 DATA "[SS][s S][s A][s M][s P][s L][
 s E][SS][s E][s N][s T][s R][s I][s E][s
  S][6"[SS]"]"                               FI
·107 REM * COLUMN HEADER FOR FACTS (18 SH
 IFTED CHARACTERS)                           MC
·108 DATA "[SS][s S][s A][s M][s P][s L][
 s E][SS][s F][s A][s C][s T][s S][5"[SS]
 "]"                                         AA
·109 REM ** QUIZ ITEMS IN CORRECT ORDER (
 20 CHAR./ENTRY, 17 SHIFTED CHAR./FACT)      PD
·110 DATA "ENTRY #1[12" "]","FASCINATING
 FACT!"                                      NN
·111 DATA "ENTRY #2[12" "]","FASCINATING
 FACT!"                                      EE
·112 DATA "ENTRY #3[12" "]","FASCINATING
 FACT!"                                      BH
·113 DATA "ENTRY #4[12" "]","FASCINATING
 FACT!"                                      JO
·114 DATA "ENTRY #5[12" "]","FASCINATING
 FACT!"                                      LJ
·115 DATA "ENTRY #6[12" "]","FASCINATING
 FACT!"                                      LA
·116 DATA "ENTRY #7[12" "]","FASCINATING
 FACT!"                                      ED
·117 DATA "ENTRY #8[12" "]","FASCINATING
 FACT!"                                      HK
·118 DATA "ENTRY #9[12" "]","FASCINATING
 FACT!"                                      DF
·119 DATA "ENTRY #10[11" "]","FASCINATING
  FACT!"                                     LA
·198 REM ** QUIZ #2 (JUST A SAMPLE)          BH
·199 REM * NUMBER OF ENTRIES, SCREEN COLO
 RS, FOREGROUND COLORS                       KL
·200 DATA 20,14,7,4,8,"[WHITE]","[BLACK]"
 ,"[BLACK]","[WHITE]"                        EM
·201 REM * QUIZ TITLE (INCLUDE 39 SHIFTED
  CHARACTERS, PLUS REVERSE ON/OFF)           MJ
·202 DATA "[RVSON][9"[SS]"][s P][s L][s A
 ][s C][s E][s S][SS][s W][s E][SS][s H][
 s A][s V][s E][SS][s L][s I][s V][s E][s
  D][10"[SS]"][RVSOFF]"                      HB
·203 REM * FORMAT/INFORMATION LINE (39 UN
 SHIFTED CHARACTERS, NOT REVERSED)           MK
·204 DATA " FROM THE EARLIEST TO THE MOST
  RECENT  "                                  FM
·205 REM * COLUMN HEADER FOR ENTRIES (21
 SHIFTED CHARACTERS)                         HE
·206 DATA "[SS][s S][s T][s R][s E][s E][
 s T][SS][s A][s D][s D][s R][s E][s S][s
  S][6"[SS]"]"                               HP
·207 REM * COLUMN HEADER FOR FACTS (18 SH
 IFTED CHARACTERS)                           MC
·208 DATA "[SS][s C][s I][s T][s Y][SS][s
  A][s N][s D][SS][s S][s T][s A][s T][s
 E][3"[SS]"]"                                BK
·209 REM ** QUIZ ITEMS IN CORRECT ORDER (
 20 CHAR. PER ENTRY, 17 CHAR. PER FACT)      LM
·210 DATA "975 LAS PALMAS DRIVE","SANTA C
 LARA[UPARROW] CA  "                         OE
·211 DATA "1425 E. DOVER STREET","MESA[UP
 ARROW] AZ[9" "]"                            EA
·212 DATA "31 'L' STREET[7" "]","SALT LAK
 E CITY[UPARROW]UT"                          BL
·213 DATA "117 'J' STREET[6" "]","SALT LA
 KE CITY[UPARROW]UT"                         CN
·214 DATA "598 HIGH RIDGE ROAD ","SANDY[U
 PARROW] UT[8" "]"                           EE
·215 DATA "370 SOUTH 650 EAST  ","OREM[UP
 ARROW] UT[9" "]"                            NK
·216 DATA "2314 MIAMI BLVD.[4" "]","SOUTH
  BEND[UPARROW] IN[3" "]"                    BN
·217 DATA "5701 COURTFIELD DR. ","GOSHEN[
 UPARROW] IN[7" "]"                          DA
·218 DATA "12 E. FRIENDLY[6" "]","GREENSB
 ORO[UPARROW] NC[3" "]"                      IE
·219 DATA "BOX 33789[UPARROW] HWY. 62  ",
 "CASWELL[UPARROW] NC[6" "]"                 NN
·220 DATA "4704 PENN WYNE DR.  ","GREENVI
 LLE[UPARROW] SC[3" "]"                      LN
·221 DATA "[3"1"] TRADD STREET[4" "]","CH
 ARLESTON[UPARROW] SC[3" "]"                 DA
·222 DATA "17 MEETING STREET[3" "]","CHAR
 LESTON[UPARROW] SC[3" "]"                   GC
·223 DATA "1490 SEAVIEW ROAD[3" "]","SULL
 IVAN'S ISL[UPARROW]SC"                      FM
·224 DATA "48 GRAMERCY PARK SO.","NEW YOR
 K CITY[UPARROW] NY"                         AB
·225 DATA "599 PARK AVENUE[5" "]","NEW YO
 RK CITY[UPARROW] NY"                        JE
·226 DATA "MIDGEWAY FARM[7" "]","PEA HOLL
 OW[UPARROW] TN[3" "]"                       KB
·227 DATA "47 GRACE COURT[6" "]","CHEVY C
 HASE[UPARROW] MD  "                         FA
·228 DATA "990 NORTH TALLICK[3" "]","SILV
 ER SPRING[UPARROW] MD"                      KH
·229 DATA "12 SADDLEBACK TRACE ","BUCKLE
 RIDGE[UPARROW] WV "                         GO
```

```
·230 REM THIS IS THE MAXIMUM NUMBER OF EN
 TRIES POSSIBLE IN ANY QUIZ              GD
·231 REM NOTICE THAT THE [UPARROW] CHARAC
 TER IS USED FOR COMMAS WITHIN ENTRIES.  GN
·232 REM 'THE LEAST AND THE MOST' CHANGES
  THIS TO A COMMA WITH CUSTOM CHARACTERS OO
```

THE MOST AND THE LEAST

```
·1 REM *** THE MOST AND THE LEAST ***    PE
·2 REM AN EDUCATIONAL GAME:  PUT LISTS IN
  THE RIGHT ORDER                        DP
·3 REM THIS PROGRAM LOOKS FOR DISK FILES
 THAT BEGIN WITH "Q "                    CA
·4 REM THESE ARE CREATED WITH THE QUIZ FI
 LES INCLUDED, OR MAKE YOUR OWN USING    DM
·5 REM THE FORMAT IN THE 'QUIZ MAKER' PRO
 GRAM                                    LM
·9 REM GO SET UP VIDEO MEMORY AND THE CHA
 RACTER SET                              BJ
·10 GOSUB 1000                           FO
·11 REM GO DISPLAY TITLE SCREEN AND GET D
 IRECTORY                                OM
·12 POKE 808,234:GOSUB 900:POKE 808,234  IC
·45 XP=CP+NA:GOTO 140                    IE
·49 REM ** JOYSTICK AND KEYBOARD READ    JP
·50 GET A$                               AL
·51 A=255-PEEK(56320):B=A AND16:A=A AND3 KF
·52 RETURN                               IM
·59 REM ** ANIMATE 'NEXT' STRING         BA
·60 NN=NN-1:IF NN<1 THEN NN=NZ           OJ
·61 A=ASC(MID$(NI$,NN,1)):B=10+VAL(MID$(N
 L$,NN,1))                               JF
·62 PRINT FC$(Q,0)VV$(2+NA)TAB(1)MID$(NX$
 ,A,B)                                   JO
·63 RETURN                               IM
·69 REM ** BLANK A LINE                  LG
·70 PRINT VV$(V)"[RVSOFF][39" "]";:RETURN JD
·100 GOSUB 60:GOSUB 50:IF A$=" "OR B>1 TH
 EN 200                                  DM
·105 IF A$="[F5]" OR A=1 THEN 120        GM
·110 IF A$="[F7]" OR A=2 THEN 130        GN
·115 GOTO 100                            CF
·119 REM * UPMOVE                        KM
·120 IF CP=(22-NA) THEN CP=LEN(QR$(Q)):GO
 TO 140                                  HK
·121 IF CP=1 THEN CP=22-NA:GOTO 140      NO
·122 CP=CP-1:GOTO 140                    AP
·129 REM * DOWNMOVE                      CI
·130 IF CP=(22-NA) THEN CP=1:GOTO 140    DE
·131 IF CP=LEN(QR$(Q))THEN CP=22-NA:GOTO
 140                                     FC
·132 CP=CP+1:GOTO 140                    AK
·139 REM * PRINT CURSOR AT NEW POSITION  OM
·140 PRINT VV$(2+XP)"[RVSOFF] "VV$(2+CP+N
 A)FC$(Q,3)CU$;:XP=CP+NA:GOTO 100        NG
·198 REM *** CHOICE HANDLING             BH
·199 REM * CHOICE TO QUIT?               JE
·200 V=2+NA:GOSUB70:IF CP=22-NA THEN 300 LM
·201 REM * WAS IT THE RIGHT ANSWER?      LL
·202 A=ASC(MID$(QR$(Q),CP,1)):IF A=NA THE
 N 230                                   CL
·209 REM ** WRONG ANSWER HANDLING        MH
·210 TP=TP-1:REM SCORE DOWN              DJ
·211 REM * FIND CORRECT ANSWER           LD
·212 FOR I=1 TO LEN(QR$(Q)):A=ASC(MID$(QR
 $(Q),I,1))                              IM
·213 IF A=NA THEN CP=I                   EO
·214 NEXT:PRINT VV$(2+XP)"[RVSOFF] "VV$(2
 +CP+NA)FC$(Q,1)CU$;:XP=CP+NA            KN
·215 REM * DISPLAY ERROR MESSAGE         II
·216 PRINT VV$(2+NA)TAB(1)FC$(Q,1)"[SS][s
 S][s O][SS][s S][s O][s R][s R][s Y][3"
 [c S]"]";:FOR I=0 TO 999:NEXT:GOTO 250  FO
·229 REM ** RIGHT ANSWER HANDLING        JA
·230 TP=TP+(QT(Q)-NA):REM SCORE UP       IE
·231 REM * DISPLAY CONGRATULATIONS       ML
·232 PRINT VV$(2+NA)TAB(1)FC$(Q,1)"[SS][s
 R][s I][s G][s H][s T][SS][s O][s N][3"
 [c K]"]";:FOR I=0 TO 999:NEXT:GOTO 250  AN
·248 REM ** SHRINK LIST AND TEST FOR END JP
·249 REM * MOVE CORRECT ANSWER FROM AVAIL
 ABLE LIST TO FINAL LIST                 CJ
·250 PRINT VV$(2+CP+NA)"[RVSOFF] ";:NA=NA
 +1:V=2+NA:GOSUB 70                      GC
·251 X=LEN(QR$(Q)):IF X<2 OR NA>QT(Q)THEN
 QR$(Q)="":GOSUB 960:GOTO 280            KB
·252 IF CP=1 THEN QR$(Q)=RIGHT$(QR$(Q),X-
 1):GOTO 255                             IA
·253 IF CP=X THEN QR$(Q)=LEFT$(QR$(Q),X-1
 ):GOTO 255                              LA
·254 QR$(Q)=LEFT$(QR$(Q),CP-1)+RIGHT$(QR$
 (Q),X-CP):GOTO 255                      LO
·255 GOSUB 960:CP=1:GOTO 140             EK
·279 REM ** LAST QUESTION WAS ANSWERED   LL
·280 PRINT VV$(24)FC$(Q,3)CU$FC$(Q,1)"[SS
 ][s G][s O][SS][s O][s N][c B][SS]";    KJ
·281 POKE 198,0                          KB
·282 GOSUB 50:IF B=0 AND A$="" THEN 282  EK
·283 REM * LAST QUIZ FINISHED, SHOW CHOIC
 ES                                      LH
·284 X=LEN(RR$):IF X<1 THEN 300          BN
·285 REM * GO SELECT NEXT QUIZ           JB
·286 GOSUB 950:XP=CP+NA:GOTO 140         EJ
·299 REM *** QUIT HANDLING               KI
·300 FOR V=3 TO 24:GOSUB 70:NEXT:POKE 198
 ,0                                      KG
·301 REM * DISPLAY OPTIONS               DC
·302 PRINT VV$(3)FC$(Q,2)"[RVSON] LEAVE T
 HE GAME ENTIRELY";                      FD
·303 PRINT VV$(4)"[RVSON] DISPLAY DIRECTO
 RY OF QUIZ FILES";                      GI
·304 PRINT VV$(5)"[RVSON] REPEAT THIS GRO
 UP OF LISTS";                           AO
·305 REM * ARE THERE ANY QUIZZES LEFT?   KC
```

```
·306 IF LEN(RR$)<1 THEN 330                  LC
·307 PRINT VV$(6)"[RVSON] RESUME THIS QUI
 Z WHERE WE LEFT IT";                        DE
·308 PRINT VV$(7)FC$(Q,1)"[3"[SS]"][s W][
 s H][s A][s T][SS][s W][s I][s L][s L][S
 S][s W][s E][SS][s D][s O][SS][s N][s O]
 [s W][c B][16"[SS]"]";                      AC
·309 REM ** PLAYER INPUT LOOP (MID-GAME)     BJ
·310 W=6:XW=6:PRINT VV$(W)FC$(Q,3)CU$;       DF
·311 REM * GET PLAYER INPUT                  PJ
·312 GOSUB 50:IF A$=" " OR B>0 THEN 340      KJ
·313 IF A$="[F5]" OR A=1 THEN W=W-1:GOSUB
 320:GOTO 312                                NA
·314 IF A$="[F7]" OR A=2 THEN W=W+1:GOSUB
 320:GOTO 312                                EB
·315 GOTO 312                                BO
·319 REM * MOVE CURSOR (MID-GAME)            DM
·320 IF W>6 THEN W=3                         MD
·321 IF W<3 THEN W=6                         LB
·322 PRINT VV$(XW)"[RVSOFF] "VV$(W)CU$;:X
 W=W:RETURN                                  BH
·324 REM * MOVE CURSOR (END-GAME)            OP
·325 IF W>5 THEN W=3                         MA
·326 IF W<3 THEN W=5                         KO
·327 PRINT VV$(XW)"[RVSOFF] "VV$(W)CU$;:X
 W=W:RETURN                                  BH
·329 REM ** PLAYER INPUT LOOP (END-GAME)     BI
·330 W=5:XW=5:PRINT VV$(W)FC$(Q,3)CU$;       GF
·331 REM * GET PLAYER INPUT                  PJ
·332 GOSUB 50:IF A$=" " OR B>0 THEN 340      KJ
·333 IF A$="[F5]" OR A=1 THEN W=W-1:GOSUB
 325:GOTO 332                                EB
·334 IF A$="[F7]" OR A=2 THEN W=W+1:GOSUB
 325:GOTO 332                                BO
·335 GOTO 332                                CE
·339 REM ** OPTION HANDLING                  BL
·340 ON W-2 GOTO 1080,350,360,370:GOTO 30
 0                                           AO
·349 REM ** RESUME GAME FROM THE START       LH
·350 POKE 53281,6:PRINT "[c 7][CLEAR]":PO
 KE 53282,2:POKE 53283,1:POKE 53284,7:RUN    HL
·359 REM ** START THIS QUIZ GROUP OVER       PD
·360 GOSUB 944:XP=CP+NA:GOTO 140             LG
·369 REM ** RESUME QUIZ WHERE WE LEFT IT     DA
·370 FOR V=3 TO 8:GOSUB 70:NEXT              IL
·371 GOSUB 960:CP=1:GOTO 140                 EK
·898 REM *** GAME OPENING                    EO
·899 REM DISPLAY TITLES                      KC
·900 PRINT"[CLEAR][RVSON][BLACK][8"[SS]"]
 [s T][s H][s E][SS][s M][s O][s S][s T][
 SS][s A][s N][s D][SS][s T][s H][s E][SS
 ][s L][s E][s A][s S][s T][9"[SS]"]"        KG
·901 POKE 53281,6:POKE 53280,6:PRINT"[3"[
 SS]"][s D][s I][s R][s E][s C][s T][s O]
 [s R][s Y][SS][s O][s F][SS][s Q][s U][s
 I][s Z][SS][s F][s I][s L][s E][s S][c
 Z][c Z][11"[SS]"]"                          KF
·902 GOSUB 1040                              FK
·903 IF X=0 THEN PRINT "INSERT DISK WITH
 'Q ' FILES AND START[3" "]AGAIN":GOTO 10
 80                                          PJ
·904 FOR I=0 TO X-1:PRINT VV$(I+2)" [RVSO
 N]"RIGHT$(FF$(I),LEN(FF$(I))-2)"[RVSOFF]
 ":NEXT                                      PH
·905 PRINT " QUIT":PRINT "[3"[SS]"][s J][
 s O][s Y][s S][s T][s I][s C][s K][SS][s
  O][s R][SS][s F][c J][c Z][s F][c Y][SS
 ][s T][s O][SS][s M][s O][s V][s E][SS][
 s A][s R][s R][s O][s W][c S][4"[SS]"]"     IG
·906 PRINT "[3"[SS]"][s B][s U][s T][s T]
 [s O][s N][SS][s O][s R][SS][s S][s P][s
  A][s C][s E][s B][s A][s R][SS][s T][s
 O][SS][s M][s A][s K][s E][SS][s C][s H]
 [s O][s I][s C][s E][c S][SS][SS]"          MN
·909 REM * GET CHOICE OF QUIZ FILE           FG
·910 CP=2:XP=CP:CU$="[RVSON][c *][RVSOFF]
 ":PRINT VV$(CP)CU$;                         FK
·911 GOSUB 50:IF A$="" AND A=0 AND B=0 TH
 EN 911                                      HB
·912 XP=CP:IF A$=" " OR B>0 THEN 920         PP
·913 IF A$="[F5]" OR A=1 THEN CP=CP-1:IF
 CP<2 THEN CP=2+X                            KM
·914 IF A$="[F7]" OR A=2 THEN CP=CP+1:IF
 CP>(2+X) THEN CP=2                          ML
·915 PRINT VV$(XP)" "VV$(CP)CU$;:GOTO 911    OB
·920 IF CP=(X+2) THEN 1080                   AP
·921 FF$=FF$(CP-2)                           PF
·922 PRINT VV$(24)"NOW LOADING [RVSON]"FF
 $"[RVSOFF]";                                IA
·929 REM ** LOAD CHOSEN FILE                 OP
·930 OPEN 15,8,15,"I":CLOSE 15:OPEN 2,8,2
 ,"0:"+FF$+",S,R"                            GP
·931 REM * HOW MANY QUIZZES IN FILE? (NO
 MORE THAN 8)                                BA
·932 INPUT#2,NQ:IF NQ>8 THEN NQ=8            AN
·933 REM * DIMENSION ARRAYS                  ED
·934 DIM QE$(8,21),QF$(8,21),QR$(8),QT(8)
 ,FC$(8,3),BC(8,3),TL$(8),FL$(8),EH$(1,8)    DM
·935 REM * LOOP THROUGH THE QUIZZES          PD
·936 FOR I=1 TO NQ:INPUT#2,QT(I):A=FRE(9)    NB
·937 REM * GET COLORS                        HK
·938 FOR J=0 TO 3:INPUT#2,BC(I,J):NEXT:FO
 R J=0 TO 3:INPUT#2,FC$(I,J):NEXT            AP
·939 REM * GET QUIZ TITLE, FORMAT, HEADS     AP
·940 INPUT#2,TL$(I):INPUT#2,FL$(I):INPUT#
 2,EH$(0,I):INPUT#2,EH$(1,I)                 MG
·941 REM * LOOP THROUGH THE ENTRIES          PC
·942 FOR J=1 TO QT(I):INPUT#2,QE$(I,J):IN
 PUT#2,QF$(I,J):NEXT:NEXT:CLOSE 2            JM
·943 REM * INITIALIZE RANDOM STRINGS         EK
·944 FOR I=1 TO NQ:SR$=LEFT$(SS$,QT(I)):A
 =RND(0):GOSUB 1070:QR$(I)=ZZ$:NEXT          IO
·945 REM * GO SET UP RANDOM STRING TO CON
 TROL QUIZ ORDER                             IM
·946 SR$=LEFT$(SS$,NQ):A=RND(0):GOSUB 107
 0:RR$=ZZ$                                   FB
·947 REM * GO SET UP 'NEXT' LINE             GO
·948 GOSUB 1060                              FI
```

```
·949 REM ** INITIALIZE NEXT QUIZ            HL
·950 Q=ASC(LEFT$(RR$,1)):A=LEN(RR$):IF A<
 2 THEN RR$="":GOTO 953                   GM
·951 RR$=RIGHT$(RR$,A-1)                   KJ
·952 REM * CLEAR SCREEN, PRINT HEADING     HL
·953 FOR I=0 TO 3:POKE 53281+I,BC(Q,I):NE
 XT:POKE 53280,BC(Q,0):PRINT "[CLEAR]";    DL
·954 PRINT VV$(0)FC$(Q,3)TL$(Q);:PRINT VV
 $(1)FC$(Q,0)FL$(Q);                       GO
·955 PRINT VV$(2)FC$(Q,1)EH$(0,Q)EH$(1,Q)
 ;                                         AF
·956 REM * INITIAL VALUES FOR QUIZ         NP
·957 NA=1                                  HJ
·959 REM ** REFRESH SCREEN                 KB
·960 CP=1:IF NA=1 THEN 964                 NN
·961 REM * PRINT ANSWERS ALREADY GIVEN     NE
·962 FOR I=1 TO NA-1:PRINT VV$(2+I)FC$(Q,
 2)"[RVSON] "QE$(Q,I)FC$(Q,3)QF$(Q,I);:NE
 XT                                        FI
·963 REM * PRINT RANDOM-ORDER LIST OF REM
 AINING ANSWERS                            DA
·964 IF LEN(QR$(Q))<1 THEN 968             EL
·965 FOR I=1 TO LEN(QR$(Q))                MM
·966 PRINT VV$(NA+2+I)FC$(Q,0)TAB(1)QE$(Q
 ,ASC(MID$(QR$(Q),I,1)))                   GF
·967 NEXT                                  IA
·968 PRINT VV$(24)FC$(Q,1)" [SS][s Q][s U
 ][s I][s T][SS]"TAB(18)FC$(Q,2)"[RVSON]
 SCORE "TP*10"[RVSOFF]";                   PC
·969 IF(PEEK(52)-PEEK(50))>12 THEN RETURN JP
·970 PRINT VV$(24)FC$(Q,2)" PAUSE FOR GAR
 BAGE COLLECTION[10"."]";                  EM
·971 A=FRE(9):RETURN                       PG
·996 RETURN                                IM
·998 REM ** VIDEO SET UP                   OL
·999 REM * LOWER TOP OF MEMORY; SET VIDEO
  CONTROL VALUES                           CH
·1000 POKE 55,255:POKE 56,138:VM=35840:CM
 =40960:SM=140                             EN
·1001 REM * SET VIDEO BLOCK                IA
·1002 POKE 56578,PEEK(56578)OR3:POKE 5657
 6,(PEEK(56576)AND 252)+1                  LJ
·1003 REM * SET SCREEN AND CHARACTER MEMO
 RY LOCATIONS                              DK
·1004 POKE 53272,56:POKE 648,SM:PRINT "[C
 LEAR][RVSON]LOADING CHARACTER SET[8"."][
 BACKARROW][c *][RVSOFF][BACKARROW][c *]" MM
·1005 REM * SWITCH TO EXTENDED BACKGROUND
  COLOR MODE                               FN
·1006 POKE 53265,PEEK(53265)OR 64:POKE 53
 282,8:POKE 53283,7:POKE 53284,1           JM
·1009 REM * COPY CHARACTER SHAPES INTO RA
 M                                         BO
·1010 POKE 56333,127:POKE 1,PEEK(1) AND 2
 51                                        AG
·1011 FOR I=0 TO 511:POKE CM+I,PEEK(53248
 +I):NEXT                                  FC
·1012 POKE 1,PEEK(1)OR 4:POKE 56333,131    LH
·1013 REM * PUT IN CUSTOM CHARACTERS (COM
 MA, ALTERED PERIOD, ALTERED LEFT ARROW)  BB
·1014 FOR I=CM+30*8 TO CM+30*8+15:READ A:
 POKE I,A:NEXT                             EG
·1015 DATA 0,0,0,0,0,96,96,192             PK
·1016 DATA 192,100,50,31,31,50,100,192     KM
·1017 FOR I=CM+46*8 TO CM+46*8+7:READ A:P
 OKE I,A:NEXT                              DC
·1018 DATA 0,0,0,0,0,96,96,0               LD
·1019 REM ** SET UP VERTICAL MOVEMENT STR
 INGS                                      KO
·1020 DIM VV$(24)                          BI
·1021 VV$(0)="[HOME]":FOR I=1 TO 24:VV$(I
 )=VV$(I-1)+"[DOWN]":NEXT                  PB
·1022 REM * INITIALIZE ORDER STRING        PP
·1023 SS$="":FOR I=1 TO 21:SS$=SS$+CHR$(I
 ):NEXT                                    GH
·1030 RETURN                               IM
·1038 REM *** DIRECTORY SEARCH ***         LA
·1039 REM * OPEN DIRECTORY FILE            KN
·1040 OPEN 15,8,15:PRINT#15,"I":OPEN2,8,2
 ,"$"                                      GM
·1041 REM * SKIP PAST HEADER BLOCK         CI
·1042 FOR I=0 TO 253:GET#2,A$:NEXT         HB
·1043 REM ** LOOP TO READ A BLOCK          JF
·1044 REM * SET UP VARIABLES               OO
·1045 X=0:F=0:DIM FF$(27),BB$(7)           PL
·1046 REM * READ 8-FILE BLOCK              NF
·1047 FOR I=0 TO 7:BB$(I)="":GET#2,A$,A$,
 A$:FOR J=3 TO 18:GET#2,A$                 IL
·1048 IF LEN(A$)>0 THENIF ASC(A$)<96 THEN
  BB$(I)=BB$(I)+A$                         MM
·1049 NEXT                                 IA
·1050 FOR J=0 TO 10:GET#2,A$:NEXT:IF I<7
 THEN GET#2,A$,A$                          PN
·1051 IF(LEN(BB$(I))>0)AND(LEFT$(BB$(I),2
 )="Q ")THEN FF$(X)=BB$(I):X=X+1           PF
·1052 NEXT:F=F+1:IF (X<20)AND(F<2)ANDLEN(
 BB$(7))>0 THEN 1047                       JG
·1055 CLOSE 2:CLOSE 15:RETURN              ON
·1059 REM ** INITIALIZE 'NEXT' STRING      EP
·1060 TP=0:NX$="NEXT[c *][RVSON][BACKARRO
 W][c *][RVSOFF][BACKARROW][s N][s E][s X
 ][s T][RVSON][BACKARROW][c *][RVSOFF][BA
 CKARROW][c *][RVSON]NEXT[RVSON][c *][RVS
 OFF][BACKARROW][c *][RVSON][BACKARROW][s
  N][s E][s X][s T][RVSOFF][BACKARROW][c
  *][RVSON][BACKARROW][c *][RVSOFF]NEXT[c
  *][RVSON][BACKARROW][c *][RVSOFF][BACKAR
  ROW][s N][s E][s X]"                     FK
·1061 NN=1:NI$="":NZ=LEN(NX$)-14:A=FRE(9)
 :FOR I=1 TO NZ                            OP
·1062 A$=MID$(NX$,I,1):IF A$<>"[RVSON]" A
 ND A$<>"[RVSOFF]" THEN NI$=NI$+CHR$(I)    EE
·1063 NEXT:A=FRE(9)                        AI
·1064 NL$="4[3"5"][3"6"]556[4"7"][5"6"]7[
 3"6"][3"5"][4"6"]55":NZ=LEN(NL$):RETURN  NB
·1067 REM **                               OO
·1068 REM ** SUBROUTINE TO SET UP          DM
·1069 REM ** RANDOM ORDER STRINGS          CO
```

```
·1070 ZZ$=""                              NO
·1071 A=LEN(SR$):B=1+INT(RND(9)*A):IF B<1
 OR B>A THEN 1071                         OB
·1072 ZZ$=ZZ$+MID$(SR$,B,1):IF LEN(SR$)=1
 THEN RETURN                              JF
·1073 IF B=1 THEN SR$=RIGHT$(SR$,A-1):GOT
O 1071                                    IO
·1074 IF B=A THEN SR$=LEFT$(SR$,A-1):GOTO
 1071                                     KN
·1075 SR$=LEFT$(SR$,B-1)+RIGHT$(SR$,A-B):
GOTO 1071                                 BN
·1079 REM *** QUIT, RESTORING SCREEN MEMO
RY TO NORMAL                              AO
·1080 POKE 53281,6:POKE 53280,14:PRINT"[c
 7]":POKE 55,255:POKE 56,159:POKE 808,23
7                                         OD
·1085 POKE 648,4:POKE 56576,PEEK(56576)OR
 3:POKE 53272,20:PRINT "[CLEAR]":END      IA
·2000 OPEN 2,8,2,FF$:GET#2,NQ:PRINT NQ:CL
OSE2:RETURN                               LC
```

WHICH IS...

```
·1 REM *** WHICH IS ... MODULE ***        CP
·2 REM LISTS FOR KIDS                     EG
·3 REM (IN DIRECT MODE, TYPE 'POKE 53265,
PEEK(53265)OR 64' TO MAKE SHIFTED         AB
·4 REM CHARACTERS SHOW UP WHEN TYPING THE
M IN                                      MN
·10 FF$="WHICH IS [3"."]"                 GH
·11 FF$="@0:Q "+LEFT$(FF$,14)+",S,W"      BP
·12 OPEN 2,8,2,FF$                        HL
·15 Z$=CHR$(13)                           LF
·17 POKE 53265,PEEK(53265)OR 64           AM
·19 REM * HOW MANY QUIZZES?               CO
·20 NQ=8:PRINT#2,NQ                       FI
·30 FOR I=1 TO NQ:READ TN:PRINT#2,TN      GB
·32 FOR J=0 TO 3:READ A:PRINT#2,A:POKE 53
281+J,A:NEXT:POKE 53280,PEEK(53281)       GC
·34 FOR J=0 TO 3:READ FC$(J):PRINT#2,FC$(
J):NEXT                                   LH
·36 READ A$,B$:A$=FC$(3)+A$:B$=FC$(0)+B$:
PRINT#2,A$Z$B$:PRINT"[CLEAR]"A$:PRINT B$  AM
·38 READ A$,B$:A$=FC$(1)+A$:B$=FC$(1)+B$:
PRINT#2,A$Z$B$:PRINT A$B$                 AC
·40 FOR J=1 TO TN                         OH
·42 READ A$,B$:C$="":A$=" "+A$:FOR K=1 TO
 LEN(B$):A=ASC(MID$(B$,K,1))              MD
·44 IF A<32 OR A>95 THEN A=160:GOTO 47    LA
·45 IF A>63 THEN A=A+32:GOTO 47           PP
·46 A=A+128                               HG
·47 C$=C$+CHR$(A):NEXT:B$="[RVSON][SS]"+C
$+"[RVSOFF]"                              OK
·49 PRINT#2,A$Z$B$:PRINT "[RVSON]"FC$(2)A
$"[RVSOFF]"FC$(3)B$:NEXT:NEXT             JN
·50 CLOSE 2:PRINT "[HOME]";:END           BM
·99 REM ** QUIZ #1                        HE
·100 DATA 7,6,8,5,7,"[WHITE]","[YELLOW]",
"[YELLOW]","[BLUE]"                       EG
·101 REM * QUIZ TITLE                     KD
·102 DATA "[RVSON][10"[SS]"][s W][s H][s
I][s C][s H][SS][s I][s S][SS][s S][s H]
[s O][s R][s T][s E][s S][s T][c B][11"[
SS]"][RVSOFF]"                            KB
·103 REM * FORMAT LINE                    MB
·104 DATA " PUT IN ORDER FROM SHORTEST TO
 LONGEST "                                JC
·105 REM * COLUMN HEADERS                 JK
·106 DATA "[SS][s T][s H][s I][s S][SS][s
 L][s O][s N][s G][SS][3"[c S]"][7"[SS]"
]"                                        LG
·108 DATA "[SS][s I][s S][SS][s T][s H][s
 I][s S][SS][s M][s A][s N][s Y][SS][3"[
c S]"][SS]"                               GM
·109 REM ** QUIZ ITEMS                    LN
·110 DATA "INCH[10" "](IN.) ","2.54 CENTI
METERS "                                  DD
·111 DATA "FOOT[10" "](FT.) ","12 INCHES[
8" "]"                                    CC
·112 DATA "YARD[10" "](YD.) ","3 FT.(36 I
N.)[4" "]"                                MN
·113 DATA "ROD[11" "](RD.) ","5.5 YD.(16.
5 FT.)"                                   DE
·114 DATA "FURLONG[6" "](FUR.) ","40 RD.(
660 FT.)  "                               HJ
·115 DATA "MILE[10" "](MI.) ","8 FUR.(5[U
PARROW]280 FT.)"                          CA
·116 DATA "LEAGUE[14" "]","3 MI.(5[UPARRO
W]280 YD.) "                              AK
·199 REM ** QUIZ #2                       HL
·200 DATA 7,14,7,4,8,"[WHITE]","[BLACK]",
"[BLACK]","[WHITE]"                       JN
·201 REM * QUIZ TITLE                     KD
·202 DATA "[RVSON][6"[SS]"][s W][s H][s I
][s C][s H][SS][s I][s S][SS][s S][s H][
s O][s R][s T][s E][s S][s T][c B][c Z][
c Z][s M][s E][s T][s R][s I][s C][7"[SS
]"][RVSOFF]"                              AL
·203 REM * FORMAT LINE                    MB
·204 DATA " ARRANGE THESE MEASURES[UPARRO
W]SHORTEST FIRST "                        FG
·205 REM * HEADERS                        MH
·206 DATA "[SS][s M][s E][s A][s S][s U][
s R][s E][13"[SS]"]"                      CG
·208 DATA "[SS][s I][s S][SS][s M][s A][s
 D][s E][SS][s O][s F][SS][3"[c S]"][3"[
SS]"]"                                    LJ
·209 REM ** QUIZ ITEMS IN CORRECT ORDER   PL
·210 DATA "MILLIMETER[6" "](MM)","0.001 M
ETER[6" "]"                               AG
·211 DATA "CENTIMETER[6" "](CM)","10 MM (
0.01 M)[3" "]"                            GJ
·212 DATA "DECIMETER[7" "](DM)","10 CM (0
.1 M)[4" "]"                              LO
·213 DATA "METER[12" "](M)","10 DM (39.37
 IN.)"                                    LO
·214 DATA "DEKAMETER[6" "](DAM)","10 M[13
" "]"                                     LF
·215 DATA "HECTOMETER[6" "](HM)","10 DAM
(100 M)[3" "]"                            EE
·216 DATA "KILOMETER[7" "](KM)","10 HM (1
 [3"0"] M)[3" "]"                         NL
·299 REM ** QUIZ #3                       HK
·300 DATA 7,2,4,7,1,"[WHITE]","[BLACK]","
 [BLACK]","[BLUE]"                        CO
·301 REM * QUIZ TITLE                     KD
·302 DATA "[RVSON][10"[SS]"][s W][s H][s
 I][s C][s H][SS][s D][s A][s Y][SS][s I]
 [s S][SS][s N][s E][s X][s T][c B][11"[S
 S]"][RVSOFF]"                            HI
·303 REM * FORMAT LINE                    MB
·304 DATA " ARRANGE THE DAYS OF THE WEEK
 IN ORDER "                               OP
·305 REM * HEADERS                        MH
·306 DATA "[SS][s D][s A][s Y][17"[SS]"]" HK
·308 DATA "[SS][s O][s R][s I][s G][s I][
 s N][s A][s L][SS][s M][s E][s A][s N][s
  I][s N][s G][SS]"                       IH
·309 REM ** QUIZ ITEMS IN CORRECT ORDER   PL
·310 DATA "SUNDAY[14" "]","SUN'S DAY[8" "
 ]"                                       NJ
·311 DATA "MONDAY[14" "]","MOON'S DAY[7"
 "]"                                      JN
·312 DATA "TUESDAY[13" "]","TIW'S DAY[8"
 "]"                                      JL
·313 DATA "WEDNESDAY[11" "]","WODEN'S DAY
 [6" "]"                                  FB
·314 DATA "THURSDAY[12" "]","THOR'S DAY[7
 " "]"                                    FJ
·315 DATA "FRIDAY[14" "]","FRIA'S DAY[7"
 "]"                                      CP
·316 DATA "SATURDAY[12" "]","SATURN'S DAY
 [5" "]"                                  EE
·399 REM ** QUIZ #4                       HJ
·400 DATA 12,3,4,5,6,"[BLUE]","[WHITE]","
 [BLACK]","[YELLOW]"                      JB
·401 REM * QUIZ TITLE                     KD
·402 DATA "[RVSON][9"[SS]"][s W][s H][s I
 ][s C][s H][SS][s M][s O][s N][s T][s H]
 [SS][s I][s S][SS][s N][s E][s X][s T][c
  B][10"[SS]"][RVSOFF]"                   IA
·403 REM * FORMAT LINE                    MB
·404 DATA " ARRANGE THE MONTHS FROM FIRST
  TO LAST "                               GC
·405 REM * HEADERS                        MH
·406 DATA "[SS][s M][s O][s N][s T][s H][
 5"[SS]"][s N][s O][c S][s O][s F][SS][s
 D][s A][s Y][s S]"                       BB
·408 DATA "[SS][s N][s A][s M][s E][SS][s
  C][s A][s M][s E][SS][s F][s R][s O][s
 M][c Z][c Z][SS]"                        NK
·409 REM ** QUIZ ITEMS IN CORRECT ORDER   PL
·410 DATA "JANUARY[11" "]31","JANUS--ROMA
 N GOD "                                  KH
·411 DATA "FEBRUARY[4" "]28 OR 29","FEBRU
 A--FEASTS[3" "]"                         HM
·412 DATA "MARCH[13" "]31","MARS--ROMAN G
 OD  "                                    DN
·413 DATA "APRIL[13" "]30","APRILIS (? AP
 HRO)"                                    CE
·414 DATA "MAY[15" "]31","MAIA--ROM.GODDE
 SS"                                      OF
·415 DATA "JUNE[14" "]30","JUNIUS (? JUNO
 )  "                                     HJ
·416 DATA "JULY[14" "]31","JULIUS CAESAR[
 4" "]"                                   NC
·417 DATA "AUGUST[12" "]31","AUGUSTUS CAE
 SAR  "                                   KE
·418 DATA "SEPTEMBER[9" "]30","'SEVENTH M
 ONTH'  "                                 IP
·419 DATA "OCTOBER[11" "]31","'EIGHTH MON
 TH'[3" "]"                               OI
·420 DATA "NOVEMBER[10" "]30","'NINTH MON
 TH'[4" "]"                               JJ
·421 DATA "DECEMBER[10" "]31","'TENTH MON
 TH'[4" "]"                               FD
·499 REM ** QUIZ #5                       HI
·500 DATA 9,6,14,1,8,"[WHITE]","[BLACK]",
 "[BLUE]","[BLUE]"                        AH
·501 REM * QUIZ TITLE                     KD
·502 DATA "[RVSON][7"[SS]"][s W][s H][s I
 ][s C][s H][SS][s P][s L][s A][s N][s E]
 [s T][SS][s I][s S][SS][s H][s O][s T][s
  T][s E][s S][s T][c B][8"[SS]"][RVSOFF]
 "                                        BC
·503 REM * FORMAT LINE                    MB
·504 DATA " DISTANCE FROM SUN[UPARROW]NEA
 REST TO FARTHEST "                       AO
·505 REM * HEADERS                        MH
·506 DATA "[SS][s P][s L][s A][s N][s E][
 s T][SS][s N][s A][s M][s E][9"[SS]"]"   LB
·508 DATA "[SS][s F][s A][s R][s T][s H][
 s E][s S][s T][SS][s D][s I][s S][s T][s
  A][s N][s C][s E]"                      LD
·509 REM ** QUIZ ITEMS IN CORRECT ORDER   PL
·510 DATA "MERCURY[13" "]","  43.4 MILL.M
 ILES"                                    MI
·511 DATA "VENUS[15" "]","  67.7 MILL.MIL
 ES"                                      JN
·512 DATA "EARTH[15" "]","  94.6 MILL.MIL
 ES"                                      LH
·513 DATA "MARS[16" "]"," 155.0 MILL.MILE
 S"                                       JC
·514 DATA "JUPITER[13" "]"," 507.0 MILL.M
 ILES"                                    DK
·515 DATA "SATURN[14" "]"," 937.5 MILL.MI
 LES"                                     OH
·516 DATA "URANUS[14" "]","1859.7 MILL.MI
 LES"                                     CN
·517 DATA "NEPTUNE[13" "]","2821.7 MILL.M
 ILES"                                    BB
·518 DATA "PLUTO[15" "]","4551.4 MILL.MIL
 ES"                                      MP
·599 REM ** QUIZ #6                       HP
·600 DATA 6,12,11,13,10,"[YELLOW]","[WHIT
 E]","[BLUE]","[c 2]"                     CO
·601 REM * QUIZ TITLE                     KD
·602 DATA "[RVSON][11"[SS]"][s W][s H][s
 I][s C][s H][SS][s I][s S][SS][s L][s I]
 [s G][s H][s T][s E][s S][s T][c B][10"[
 SS]"][RVSOFF]"                           PF
```

```
·603 REM * FORMAT LINE                    MB
·604 DATA "[3" "]WEIGHTS FROM LIGHTEST TO
 HEAVIEST[3" "]"                          NI
·605 REM * HEADERS                        MH
·606 DATA "[SS][s W][s E][s I][s G][s H][
s T][14"[SS]"]"                           AO
·608 DATA "[SS][s I][s S][SS][s M][s A][s
 D][s E][SS][s O][s F][SS][3"[c S]"][3"[
SS]"]"                                    LJ
·609 REM ** QUIZ ITEMS IN CORRECT ORDER   PL
·610 DATA "GRAIN[10" "](GR.)","64.8 MILLI
GRAMS  "                                  ID
·611 DATA "DRAM[11" "](DR.)","27-11/32 GR
AINS  "                                   LN
·612 DATA "OUNCE[10" "](OZ.)","16 DRAMS[9
" "]"                                     JO
·613 DATA "POUND[10" "](LB.)","16 OUNCES[
8" "]"                                    FC
·614 DATA "HUNDREDWEIGHT (CWT.)","100 POU
NDS[7" "]"                                KA
·615 DATA "TON[17" "]","20 CWT.(2[3"0"] L
B.)"                                      KF
·699 REM ** QUIZ #7                       HO
·700 DATA 9,3,9,1,5,"[BLACK]","[YELLOW]",
"[c 2]","[BLACK]"                         KP
·701 REM * QUIZ TITLE                     KD
·702 DATA "[RVSON][9"[SS]"][s S][s O][s M
][s E][s T][s H][s I][s N][s G][c M][s S
][SS][s C][s O][s O][s K][s I][s N][s G]
[11"[SS]"][RVSOFF]"                       FH
·703 REM * FORMAT LINE                    MB
·704 DATA "[3" "]RECIPE MEASURES FROM LEA
ST TO MOST  "                             AP
·705 REM * HEADERS                        MH
·706 DATA "[SS][s M][s E][s A][s S][s U][
s R][s E][13"[SS]"]"                      CG
·708 DATA "[SS][s I][s S][SS][s M][s A][s
 D][s E][SS][s U][s P][SS][s O][s F][SS]
[3"[c S]"]"                               OG
·709 REM ** QUIZ ITEMS IN CORRECT ORDER   PL
·710 DATA "DROP[16" "]","NOT VERY MUCH[4"
 "]"                                      KF
·711 DATA "TEASPOON[6" "](TSP.)","60 DROP
S[9" "]"                                  NP
·712 DATA "TABLESPOON[4" "](TBL.)","3 TEA
SPOONS[6" "]"                             PK
·713 DATA "OUNCE[10" "](OZ.)","2 TABLESPO
ONS[4" "]"                                NF
·714 DATA "GILL[16" "]","4 OUNCES[9" "]"  OF
·715 DATA "CUP[17" "]","8 OZ. (16 TBL.)
"                                         JL
·716 DATA "PINT[11" "](PT.)","2 CUPS (16
OZ.)  "                                   NE
·717 DATA "QUART[10" "](QT.)","2 PINTS (3
2 OZ.) "                                  KI
·718 DATA "GALLON[8" "](GAL.)","4 QT.(3.7
85 L)[3" "]"                              LE
·799 REM ** QUIZ #8                       HN
·800 DATA 8,5,13,2,10,"[WHITE]","[BLACK]"
,"[WHITE]","[BLACK]"                      LE
·801 REM * QUIZ TITLE                     KD
·802 DATA "[RVSON][7"[SS]"][s W][s H][s I
][s C][s H][SS][s I][s S][SS][s C][s L][
s O][s S][s E][s S][s T][SS][s T][s O][S
S][s H][s O][s M][s E][c B][7"[SS]"][RVS
OFF]"                                     OI
·803 REM * FORMAT LINE                    MB
·804 DATA "[4" "]YOU LIVE 'IN' ALL THESE
PLACES[5" "]"                             NP
·805 REM * HEADERS                        MH
·806 DATA "[SS][s Y][s O][s U][SS][s L][s
 I][s V][s E][SS][s I][s N][SS][3"[c S]"
][5"[SS]"]"                               MI
·808 DATA "[SS][s I][s T][SS][s I][s S][S
S][s A][SS][3"[c S]"][6"[SS]"]"           AP
·809 REM ** REVISE THIS LIST TO FIT YOUR
OWN SITUATION  *************************  KG
·810 DATA "675 LINDLEY RD.[5" "]","HOUSE/
APARTMENT  "                              OB
·811 DATA "FRIENDSHIP[10" "]","TOWNSHIP/B
OROUGH "                                  HC
·812 DATA "GREENSBORO[10" "]","TOWN/CITY[
8" "]"                                    LG
·813 DATA "GUILFORD[12" "]","COUNTY/PARIS
H[4" "]"                                  FA
·814 DATA "NORTH CAROLINA[6" "]","STATE/P
ROVINCE[3" "]"                            KK
·815 DATA "UNITED STATES[7" "]","NATION[1
1" "]"                                    KL
·816 DATA "NORTH AMERICA[7" "]","CONTINEN
T[8" "]"                                  AJ
·817 DATA "EARTH[15" "]","PLANET[11" "]"  DI
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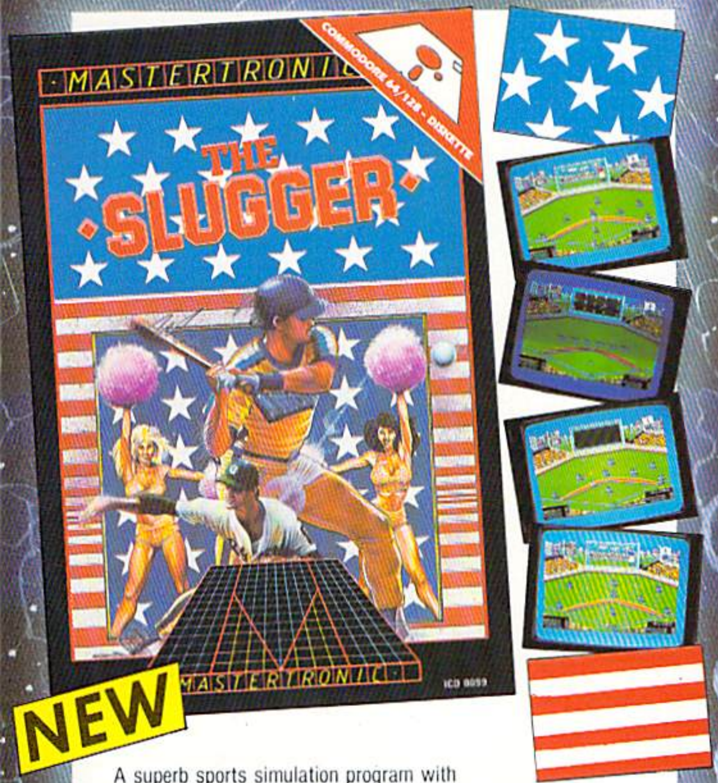

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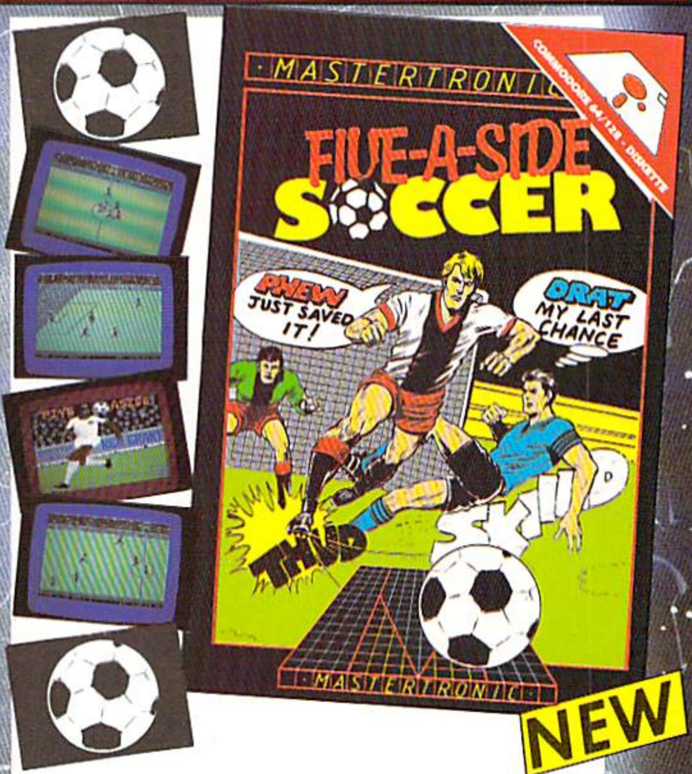

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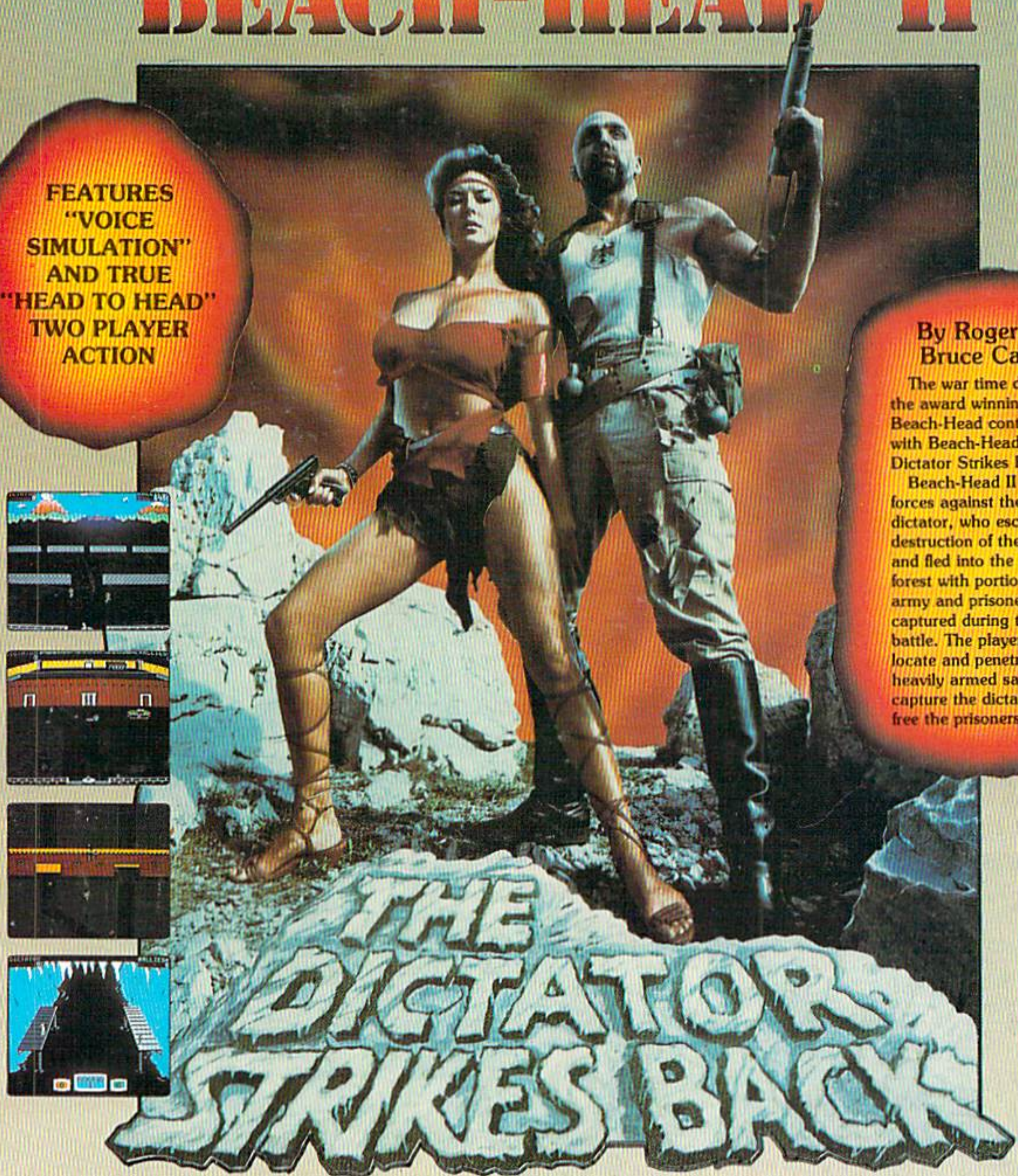

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